REVISIONS TO HWC MACT PROPOSAL
3-25-04

A. Recalculation of Cost-Effectiveness of Beyond-the-Floor PM Standard

We just learned that we calculated metal HAP emissions reductions incorrectly for the beyond-the-floor PM standard for coal-fired boilers. We inadvertently included emissions reductions from RCRA metals that are not subject to regulation pursuant to 112D. The incremental reduction of metal HAP emissions would be 6.8 tons per year, rather than 15 tons per year, which raises the cost-effectiveness to $190,000/ton of metal HAP rather than $87,000/ton.

The cost-effectiveness per ton of incremental PM reductions remains the same at $3,200.

The revised cost per ton of emissions reduction does not affect EPA's decision to propose the beyond-the-floor standard. The beyond-the-floor standard remains cost effective considering the metal HAP that would be controlled by changes to the design, operation, and maintenance of existing electrostatic precipitators and fabric filters. In addition, the beyond-the-floor standard would be consistent with the recently promulgated PM standard for coal-fired industrial boilers that do not burn hazardous waste.

B. Revisions to Section 112(d)(4) Discussion

1. Revised discussion of acute exposure to state in the first paragraph that acute exposure need not be considered when calculating total chlorine emission limits.

2. Revised statement in discussion of ample margin of safety to clarify that emissions from collocated hazardous waste combustors would be considered in determining whether a Hazard Index of 1.0 is exceeded.

3. Revised discussion of CKRC's approach to establish a national risk-based total chlorine standard for cement kilns to delete the statement that the approach is more consistent with the idea of a uniform national standard.

   See attachment A (attached at the end of this document) for revised preamble language for section 112(d)(4) showing changes to the 3-22 draft in blue strikeout and red underline.

C. Cement Kiln Alternative Standard for Mercury

Background: It is EPA's intent to preserve a source's ability to comply with an alternative mercury standard in situations where the source cannot achieve the mercury emission standard due to contributions of mercury in the raw materials. This is not clear in the current preamble discussion (shown below).

Current preamble: "In the September 1999 final rule, we acknowledged that a cement kiln using properly designed and operated MACT control technologies, including controlling the levels of metals in the hazardous waste, may not be capable of achieving a given emission standard because of mineral and process raw material contributions that might cause an exceedance of the emission standard. To address this concern, we promulgated a provision that allows kilns to petition for alternative standards provided they submit site-specific information that shows raw material hazardous air pollutant contributions to the emissions prevent the source from complying with the emission standard even though the kiln is using MACT control. See §63.1206(b)(10)."

"Today's proposed floor of 64 ug/dscm, which was based on a hazardous waste MTEC of 26 ug/dscm, may likewise necessitate such an alternative because contributions of mercury in the raw materials and fossil fuels at some sources may cause an exceedance of the emission standard. Therefore, we are considering retaining the alternative standard; however, we also request comment on whether to delete the alternative standard petitioning process of §63.1206(b)(10) and instead allow sources to comply either with the stack emission standard or hazardous waste MTEC level (without a requirement to submit a petition). This approach would establish the mercury standard as either 64 ug/dscm or a hazardous waste MTEC of 26 ug/dscm. If we were to adopt such an approach, we would require sources to comply with either limit they select on an annual basis because it is based on normal emissions data."

EPA Response: The preamble has been revised as follows.

"In the September 1999 final rule, we acknowledged that a cement kiln using properly designed and operated MACT control technologies, including controlling the levels of metals in the hazardous waste, may not be capable of achieving a given emission standard because of mineral and process raw material contributions that might cause an exceedance of the emission standard. To address this concern, we promulgated a provision that allows kilns to petition for alternative standards provided they submit site-specific information that shows raw material hazardous air pollutant contributions to the emissions prevent the source from complying with the emission standard even though the kiln is using MACT control. See §63.1206(b)(10)."

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~~we were to adopt such an approach, we would require sources to comply with either limit they select on an annual basis because it is based on normal emissions data."~~ The Agency intends to retain a source's ability to comply with an alternative standard, and we request comment on two approaches to accomplish this. The first approach would be to structure the alternative standard similar to the petitioning process used under §63.1206(b)(10). In the case of mercury for an existing cement kiln, MACT would be defined as a hazardous waste feedrate corresponding to an MTEC of 26 ug/dscm. If we were to adopt this approach, we would require sources, upon approval of the petition by the Administrator, to comply with this hazardous waste MTEC on an annual basis because it is based on normal emissions data. Under the second approach, we would structure the alternative standard similar to the framework used for the alternative interim standards for mercury under §63.1206(b)(15). The operating requirement would be an annual MTEC not to exceed 26 ug/dscm.

D. Modifications to Chapter 6 benefits write-ups for PM, mercury, and waste minimization

These modified writeups are included in attachments B,C, D.

ATTACHMENT A: REVISIONS TO SECTION 112(D)(4) DISCUSSION

3-2~~2~~4-04

XIII.   What Is the Rationale for Proposing An Alternative Risk-Based Standard for Total Chlorine in Lieu of the MACT Standard?

Under authority of CAA Section 112(d)(4), we propose standard procedures to allow you to establish a risk-based emission limit for total chlorine in lieu of compliance with the section 112(d)(2) MACT emission standard. See proposed § 63.1215. The risk-based approach would be applicable to all hazardous waste combustors except hydrochloric acid production furnaces. Because we are proposing to use the MACT standard for total chlorine as a surrogate to control metal HAP for the hydrogen chloride production furnace source category, we cannot allow any variance from the standard. For the other hazardous waste combustor source categories, we are proposing the section 112 (d) (4) standard as an alternative to the MACT standard. Sources could choose which of these two standards they would prefer to apply.

The alternative risk-based emission limit for total chlorine would be based on national exposure standards established by EPA that ensure protection of public health with an ample margin of safety. The standard would consist of a nationally-applicable, uniform algorithm that would be used to establish site-specific emission limitations based on site-specific input from each source choosing to use this approach. Thus, these standards would provide a uniform level of risk reduction, consistent with the requirement of section 112(d)(4) that EPA establish "emission standards", i.e. a requirement established by EPA which limits quantity, rate or concentration of air emissions (see CAA section 302(k)).

We also request comment on an alternative approach to implement section 112(d)(4) for cement kilns in which we establish a national risk-based emission standard for total chlorine that would be applicable to all cement kilns. Under this approach, EPA would issue a single total chlorine emission standard using an emission level that meets our national exposure standards if each cement kiln were to emit at that level.

We believe that most hazardous waste combustors are likely to consider establishing risk-based standards for total chlorine because the MACT standards proposed today are more stringent, and in some cases substantially more stringent, than currently applicable standards (e.g., the total chlorine standard for incinerators is currently 77 ppmv while we propose today a MACT standard of 1.4 ppmv).

A. What Is the Legal Authority to Establish Risk-Based Standards?

Under the authority of section 112(d)(4), the Administrator may establish emission standards based on risk, in lieu of the technology-based MACT standards, when regulating HAP for which health threshold levels have been established. Under section 112(d)(4), Congress gave EPA the discretion to consider the health threshold of any HAP and to use that health threshold, with an ample margin of safety, to set emission standards for the source category or subcategory. In the legislative history accompanying this provision, the Senate Report stated,

> "To avoid expenditures by regulated entities that secure no public health or environmental benefit, the Administrator is given discretionary authority to consider the evidence for a health threshold higher than MACT at the time the standard is under review. The Administrator is not required to take such factors into account; that would jeopardize the

standard-setting schedule imposed under this section with the kind of lengthy study and debate that has crippled the current program. But where health thresholds are well established, for instance in the case of ammonia, and the pollutant presents no risk of other adverse health effects, the Administrator may use the threshold with an ample margin of safety (and not considering cost) to set emissions limitations for sources in the category or subcategory." (S. Rep. No. 228, 101st Cong. 1st Sess. at 171 (1989); see also id. at 175-176 (1989).)

EPA has previously used section 112(d)(4) authority in the Industrial Boiler and Process Heater MACT Final Rule signed Feb. 26, 2004, the Pulp and Paper MACT Phase II (66 FR 3180, January 12, 2001) and the Lime Manufacturing MACT (69 FR 394, January 5, 2004), and has proposed to use it in a different manner in several other MACT rulemakings (e.g., the Reciprocating Internal Combustion Engine MACT (67 FR 77830, December 19, 2002).[1] The approach we propose today is nearly identical to the approach EPA recently adopted for the Industrial Boiler and Process Heater MACT source category, which allows a source to establish a site-specific risk-based emission limit for threshold HAP using prescribed procedures. This approach differs from the previous MACT rules where EPA simply determined, on a national basis, what level of exposure from each source in the category would be protective of public health with an ample margin of safety, and did not pose significant adverse environmental impacts. This previous approach resulted in a determination that no standard was necessary because no source in the category could exceed such a risk-based standard. Today's proposal varies in that the level of protection afforded by the standard is uniform, but the limits for individual sources differ due to site-specific factors. As explained later in this section of the preamble, EPA is, however, also considering for cement kilns applying the single national standard approach adopted in earlier rules.

B.   What Is the Rationale for the National Exposure Standards?

We identify as national exposure standards threshold levels that are protective of human health from both chronic and acute exposure. In addition, because EPA has discretion whether or not to promulgate risk-based standards pursuant to section 112(d)(4), we would not allow an alternative standard where emission levels may result in adverse environmental effects that would otherwise be reduced or eliminated. We would not issue the alternative standard even though it may be shown that emissions do not approach or exceed levels requisite to protect public health with an ample margin of safety because we believe the statute requires that we consider effects on terrestrial animals, plants, and aquatic ecosystems in addition to public health in establishing a standard pursuant to section 112(d)(4). See S. Rep. 228 at 176: "Employing a health threshold or safety level rather than the MACT criteria to set standards shall not result in adverse environmental effects which would otherwise be reduced or eliminated."

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[1]   The Agency also proposed to use Section 112(d)(4) authority in two other MACT rulemakings--the Combustion Turbine MACT (68 FR 1888, January 14, 2003), and the Chlorine Production MACT (67 FR 44671)--but determined that MACT standards for those source categories are not warranted and delisted the source categories from the Section 112(c) list of major sources pursuant to the authority in Section 112(c)(9).

1.   What Are the Human Health Threshold Levels?

a. Chronic Exposure. Hydrogen chloride is corrosive to the eyes, skin, and mucous membranes. Chronic exposure may cause gastritis, bronchitis, dermatitis, and dental discoloration and erosion. Chronic exposure to chlorine gas can cause respiratory effects including eye and throat irritation and airflow obstruction. See discussion in Part One, Section I.E of this preamble.

Given that neither hydrogen chloride nor chlorine gas is known to produce a carcinogenic response[2], we use reference air concentrations (RfC) to assess the likelihood of non-cancer health effects in humans. The RfC is an estimate of a continuous inhalation exposure to the human population, including sensitive subgroups, that is likely to be without an appreciable risk of deleterious effects over a lifetime. We use an RfC for hydrogen chloride of 20 ug/m^3, as presented in EPA's Integrated Risk Information System (IRIS). We propose to use an RfC for chlorine gas of 0.2 ug/m^3 based on a provisional assessment prepared by EPA on inhalation hazards from chlorine.[3] This is the same as the value for chlorine used by the State of California's Office of Environmental Health Hazard Assessment, which they refer to as a chronic "Reference Exposure Level" (REL).[3] Because RfCs can change over time based on new information, the rule would require you to use the current RfC value found at http://epa.gov/ttn/atw/toxsource/summnary.html.

We considered how to account for the fact that chlorine gas photolyzes in the atmosphere in bright sunlight to chlorine ions and then quickly reacts with hydrogen or methane to form hydrogen chloride. The half-life of chlorine due to photolysis in bright sunlight is estimated to be 10 minutes.[4] Nonetheless, this is generally sufficient time for the plume to reach nearby ground-level receptors without significant transformation. In addition, such transformation is possible only a portion of the time. Photolysis does not occur at night and is reduced on overcast or cloudy days. Generally speaking, the rate of photolysis depends on the particular wavelength and intensity of solar radiation reaching the earth's surface which varies greatly depending on the solar angle which changes with the time of day, the season of the year, and the latitude at a given

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[2]   EPA conducted an assessment of the carcinogenicity of chlorine gas and concluded that it is not likely to be a human carcinogen (see EPA's June 22, 1999 Risk Assessment Issue Paper for Derivation of a Provisional Chronic Inhalation RfC for Chlorine, p.12). The International Agency for Research on Cancer (IARC) concluded that hydrochloric acid is not classifiable as to its carcinogenicity to humans (see IARC Monographs, Vol. 54: Occupational Exposures to Mists and Vapours from Strong Inorganic Acids; and Other Industrial Chemicals (1992) p.189).

[3]   See EPA's externally peer-reviewed "Risk Assessment Issue Paper for Derivation of a Provisional Chronic Inhalation RfC for Chlorine" (June 22, 1999) that can be found in the docket for today's proposal.

[4]   As determined by a modeling analysis done by the Air Pollution Research Center at the University of California at Riverside, as reported in a California Air Resources Board fact sheet, "Toxic Air Contaminant Identification List Summaries - ARB/SSD/SES," p. 231, September 1997. See also http://www.arb.ca.gov/toxics/tac/factshts/chlorine.pdf.

location. While the ideal approach would be explicit modeling of photolysis rates as a function of solar insolation, sky conditions, absorption cross-section, quantum yield, and subsequent transformation to hydrogen chloride, to our knowledge no such regulatory air dispersion model currently exists.

Because it is reasonable to believe that receptors will be exposed to chlorine gas before appreciable transformation occurs due to the variability and complexity of the transformation and the fact that chlorine gas is considerably more toxic than hydrogen chloride, we conclude that, for the purpose of protection of public health, it is prudent to assume that chlorine gas is not transformed to hydrogen chloride.

b. Acute Threshold Levels. Short-term exposure to hydrogen chloride may cause eye, nose, and respiratory tract irritation and inflamation and pulmonary edema. Short-term exposure to high levels of chlorine gas can result in chest pain, vomiting, toxic pneumonitis, and pulmonary edema. At lower levels, chlorine gas is a potent irritant to the eyes, the upper respiratory tract, and lungs. See Part One, Section I.E. Please note that, although we discuss here how we would consider acute exposure, we conclude below that you need not assess acute exposure to establish an emission limit for total chlorine. See discussion in Section B.2.e.

To assess effects from acute exposure, we ~~propose to~~would use the acute exposure guideline level (AEGL). AEGL toxicity values are estimates of adverse health effects due to a single exposure lasting 8 hours or less. Consensus toxicity values for effects of acute exposures have been developed by several different organizations. EPA, in conjunction with the National Research Council and National Academy of Sciences, is in the process of setting acute exposure guideline levels. A national advisory committee organized by EPA has developed AEGLs for priority chemicals for 10-minute, 30-minute, 1-hour, 4-hour, and 8-hour airborne exposures. They have also determined for each exposure duration the levels of these chemicals that will protect against notable discomfort (AEGL-1), serious effects (AEGL-2), and life-threatening effects or death (AEGL-3).[5] To be protective of public health, we propose to use the AEGL-1 values to assess acute exposure: 2.7 mg/m^3 (1.8 ppm) for hydrogen chloride, and 1.4 mg/m^3 (0.5 ppm) for chlorine gas.[6] Airborne concentrations of a substance above the AEGL-1 could cause

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[5]   The full definitions of the AEGL values are more nuanced. AEGL 1: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure. AEGL 2: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape. AEGL 3: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

[6]   For hydrogen chloride and chlorine gas (individually), the AEGL-1 values for 10-minute, 30-minute, 1-hour, and 8-hour exposures are the same. Therefore, when comparing

notable discomfort, irritation, or certain asymptomatic nonsensory effects in the general population, including susceptible individuals. Please note, however, that airborne concentrations below the AEGL-1 could produce mild odor, taste, or other sensory irritations. Effects above the AEGL-1 (but below the AEGL-2) are not disabling and are transient and reversible upon cessation of exposure.

2.   What Exposures Would You Be Required to Assess?

We discuss below the following issues: (1) use of the Hazard Index to assess exposure to both hydrogen chloride and chlorine gas; (2) exposure to emissions of respiratory irritant HAP other than hydrogen chloride and chlorine gas; (3) exposure to emissions of respiratory irritant HAP from collocated sources; (4) exposure to ambient background levels of respiratory irritant HAP; and (5) ~~whether~~our conclusion that acute exposure need~~s to~~ not be assessed ~~if~~to establish emission limits because the Hazard Index for chronic exposure is expected to be higher in all situations.

a. Hazard Index. Noncancer risk assessments typically use a metric called the Hazard Quotient (HQ) to assess risks of exposures to noncarcinogens. The HQ is the ratio of a receptor's potential exposure (or modeled concentration) to the health reference value or threshold level (e.g., RfC or AEGL) for an individual pollutant. HQ values less than 1.0 indicate that exposures are below the health reference value or threshold level and, therefore, that such exposures are without appreciable risk of adverse effects in the exposed population. HQ values above 1 do not necessarily imply that adverse effects will occur, but that the likelihood of such effects in a given population increases as HQ values exceed 1.0.[7]

When the risk of noncancer effects from exposure to more than one pollutant to the same target organ must be assessed, the effects are generally considered to be additive and the HQ values for each pollutant are summed to form an analogous metric called the Hazard Index (HI). Assuming additivity, HI values less than 1.0 indicate that exposures to the mixtures are likely to be without appreciable risk of adverse effects in the exposed population. HI values above 1.0 do not necessarily imply that adverse effects from exposure to the mixture will occur, but that the likelihood of such effects in a given population increases as HI values exceed 1.0.

For purposes of establishing risk-based emission limits for total chlorine, we propose to allow a maximum HI value of not greater than 1.0.

b. Exposure to Emissions of HAP other than Hydrogen Chloride and Chlorine Gas that Have a Common Mechanism of Action. We have identified in the table below 40 HAP that are respiratory irritants, including hydrogen chloride and chlorine gas. Because these HAP have a common mechanism of action, we must determine whether exposure to these HAP must be considered when determining that the HI is less than or equal to 1.0.

Respiratory Irritant HAP

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predicted ambient levels of exposure to the AEGL-1 value, we believe it is reasonable to evaluate maximum 1-hour ground level concentrations.

[7]   See US EPA Glossary of Key Terms for National Air Toxics Assessment, at http://www.epa.gov/ttn/atw/nata/gloss1.html.

1,2-Epoxybutane	Hexachlorocyclopentadiene
1,3-dichloropropene	Hexamethylene 1,6-diisocyanate
2,4-Toluene diisocyanate	Hydrochloric acid
2-Chloroacetophenone	Maleic anhydride
Acetaldehyde	Methyl bromide
Acrolein	Methyl isocyanate
Acrylic acid	Methyl methacrylate
Acrylonitrile	Methylene diphenyl diisocyanate
	N-hexane
Antimony	Naphthalene
Beryllium	Nickel
Bis(2-ethylhexyl)phthalate	Nitrobenzene
Chlorine	Phosgene
Chloroprene	Phthalic anhydride
Chromium	Propylene dichloride
Cobalt	Propylene oxide
Diethanolamine	Styrene oxide
Epichlorohydrin	Titanium tetrachloride
Ethylene glycol	Toluene
Formaldehyde	Triethylamine
	Vinyl acetate

In making this determination, we would consider only those respiratory irritants that are HAP (as opposed to also considering respiratory irritants that are criteria pollutants) not only because section 112 deals with control of emissions of HAP, but also because ambient levels of criteria pollutants that have a common mechanism of action with hydrogen chloride and chlorine gas (e.g., SO_x, NO_x, PM, ozone) are controlled through the applicable State Implementation Plans demonstrating compliance with the National Ambient Air Quality Standards for these pollutants.

In addition to hydrogen chloride and chlorine gas, several of the respiratory irritant HAP listed in the table above may be emitted by hazardous waste combustors, including the metals antimony trioxide, beryllium, chromium (VI), cobalt, and nickel, and the organic compounds Bis(2-ethylhexyl)phthalate, formaldehyde, napthalene, and toluene.[8] We do not believe, however, that these respiratory irritant HAP would be emitted by hazardous waste combustors at levels that would result in significant Hazard Quotient values. Beryllium and chromium would be controlled by emission standards for low volatile metals and the remaining metal HAP would be controlled by a particulate matter standard. Emissions of the respiratory irritant organic HAP would be controlled to trace levels by the MACT standards for carbon monoxide or hydrocarbons and destruction and removal efficiency (DRE). Accordingly, we propose to require you to quantify and assess emissions from the hazardous waste combustor of hydrogen chloride and chlorine gas only; you would not be required to account for these other respiratory irritant HAP because they would not contribute substantially to the Hazard Index.

c. Exposure to Emissions of Respiratory Irritant HAP from Collocated Sources. You would be required to account for exposure to emissions of hydrogen chloride and chlorine gas from all on-site hazardous waste combustors subject to Subpart EEE, Part 63. EPA will address exposure to emissions of respiratory irritant HAP from other sources that may be collocated with a hazardous waste combustor--for example, process vents and fossil fuel boilers-- under the residual risk requirements of section 112(f) for both hazardous waste combustors and (potentially) other MACT source categories. See A Legislative History of the Clean Air Act Amendments of 1990 (Senate Print 103-38, 103d Cong. 1st sess.) vol. 1 at 868-69 (floor statement of Sen. Durenberger (Senate floor manager for section 112) during debate on the Conference Report, indicating that EPA is obligated to consider "combined risks of all sources that are collocated with such sources within the same major source" but going on to state that the determination of ample margin of safety from emissions from all collocated sources need not occur at the same time, but rather can be spread out over the course of the residual risk determination process for all major sources.

d. Exposure to Ambient Background Levels of Respiratory Irritant HAP. Background levels of respiratory irritant HAP attributable to emissions from off-site sources would not be considered when establishing risk-based limits for total chlorine under section 112(d)(4). Rather, these background levels will be addressed (as may be necessary) through other CAA programs such as the urban air toxics program.

e. Acute Exposure Need Not Be Assessed. We have determined that you need not assess acute exposure to establish an emission limit for total chlorine. You would not be required to model maximum 1-hour average off-site ground level concentrations to calculate a Hazard Index (HI) based on acute exposure for purposes of establishing an emission limit for total chlorine. We conclude that the chronic exposure Hazard Index (HI) for the hazardous waste combustor(s) would always exceed the acute exposure HI. Thus, the emission limit for total chlorine based on

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[8]   Betty Willis, et al, Agency for Toxic Substances and Disease Registry, US Department of Health and Human Services, "Public Health Reviews of Hazardous Waste Thermal Treatment Technologies: A Guidance Manual for Public Health Assessors," March 2002, Table 4.

chronic exposure would always be more stringent than the limit based on acute exposure. As an example, the Cement Kiln Recycling Coalition evaluated both chronic and acute exposure to hydrogen chloride and chlorine gas for the 14 cement facilities that burn hazardous waste.[9] In all cases, the chronic HI exceeded the acute HI. In addition, we determined that the Hazard Quotient (HQ) for chronic exposure was always higher than the HQ for acute exposure for the HAP we evaluated in the risk assessment we used to support the 1999 Final MACT Rule for hazardous waste combustors.[10]

Not requiring an acute exposure analysis reduces the burden on both the regulated community and regulatory officials to develop and review an analysis that would be superseded by the chronic exposure analysis when establishing an emission limit for total chlorine.

Please note that this discussion relates to evaluating acute exposure in establishing an emission limit for total chlorine. Although we conclude that the chronic exposure Hazard Index would always be higher than the acute exposure Hazard Index, and thus would be the basis for the total chlorine emission rate limit, this relates to acute versus chronic exposure to a constant, maximum average (e.g., a maximum annual average) emission rate of total chlorine from a hazardous waste combustor. Acute exposure must be considered, however, when establishing operating requirements (e.g., feedrate limit for total chlorine and chloride) to ensure that short-term emissions do not result in an acute exposure Hazard Index of 1.0 or greater even though long-term (e.g., annual average) emissions do not exceed the limit. See discussion in Section G.1 below.

      3.   Does the Proposed Approach Ensure an Ample Margin of Safety?

Section 112(d)(4) allows EPA to develop risk-based standards for HAP "for which a health threshold has been established", and the resulting standard is to provide an "ample margin of safety." The "ample margin of safety" standard, at least as applied to nonthreshold pollutants, typically connotes a two-step process (based on the standard first announced in the so-called Vinyl Chloride decision (NRDC v. EPA, 824 F. 2d at 1146 (D.C. Cir. 1987)), whereby EPA "first [determines] ... a 'safe' or 'acceptable' level of risk considering only health factors, followed by a second step to set a standard that provides an 'ample margin of safety', in which costs, feasibility, and other relevant factors in addition to health may be considered." 54 FR at 38045. It is not clear that Congress intended this analysis to apply to Section 112(d)(4) standards, since the principal legislative history to the provision indicates that costs are not to be considered in setting standards under Section 112(d)(4) (S. Rep. 228 at 173), whereas cost normally is a relevant consideration in the second part of the ample margin of safety process, as described above. Further, if issues of feasibility, cost, and other non-health factors are to be taken into account in establishing Section 112(d)(4) standards, it would be exceedingly difficult, if not practically impossible, to do so on a site-specific basis, undermining the approach we are proposing here.

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[9]   See Trinity Consultants, "Analysis of HCl/|Cl2 Emissions from Cement Kilns for 112(d)(4) Consideration in the HWC MACT Replacement Standards," September 17, 2003.

[10]   See USEPA, "Human Health and Ecological Risk Assessment Support to the Development of Technical Standards for Emissions from Combustion Units Burning Hazardous Wastes: Background Document," July 1999.

Nor is it clear that the two-step approach is necessarily warranted when considering threshold pollutants, since there is greater certainty regarding levels at which adverse health effects occur. See <u>Vinyl Chloride</u>, 824 F. 2d at 1165 n. 11.[11]

We specifically request comment on how to ensure that the emission limits calculated using the health threshold values (e.g., RfCs and AEGL-1 values), and after considering ~~collocated sources of~~ emissions of respiratory irritant HAP <u>from collocated hazardous waste combustors</u>, achieve an ample margin of safety.

4.   How Are Effects on Terrestrial Animals Addressed?

We believe the RfC values for hydrogen chloride and chlorine gas should be generally protective for chronic effects in most, if not all, fauna. We note that the RfC values are based on animal studies. Although the AEGL-1 values for acute exposure are based on human data, we nonetheless expect that they too would be generally protective of most fauna, absent information to the contrary.

5.   How Are Effects on Plants Addressed?

EPA has not established ecotoxicity values that are protective of vegetation. Nonetheless, for the reasons discussed below we do not believe that ambient concentrations of hydrogen chloride and chlorine gas that meet the human health threshold values discussed above will pose adverse effects on plants.

As discussed in the preamble to the Lime Manufacturing NESHAP proposed rule (67 FR 78056)[12], chronic exposure to about 600 $\mu g/m^3$ can be expected to result in discernible effects, depending on the plant species. Effects of acute, 20-minute exposures of 6,500 to 27,000 g/m^3 include leaf injury and decrease in chlorophyll levels in various species. The hydrogen chloride RfC of 20 $\mu g/m^3$ is well below the 600 $\mu g/m^3$ effect level, and the AEGL-1 value for hydrogen chloride of 2,700 $\mu g/m^3$ is far below the 6500 $\mu g/m^3$ acute effect level. Therefore, no adverse exposure effects are anticipated.

We specifically request additional information on ecotoxicity for both acute and chronic exposure of vegetation to hydrogen chloride and chlorine gas.

C.   How Would You Determine if Your Total Chlorine Emission Rate Meets the Eligibility Requirements Defined by the National Exposure Standards?

Under the risk-based approach to establish an alternative to the MACT standard for your total chlorine emission limit, you would have to demonstrate that emissions of total chlorine from on-site hazardous waste combustors result in exposure to the actual most-exposed individual residing off site of a Hazard Index of less than or equal to 1.0. (Put another way, we are proposing to establish this level of risk as the national emission limitation, with the rule further

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[11]   Indeed, using the classic two-step approach to "ample margin of safety" could result in the same standards we are proposing as MACT for HCl and Cl_2 for all of the affected source categories (if one assumes that all of the standards would be below protective risk-based levels for all sources), since we believe that the proposed technology-based standards would be justifiable based on considerations of technical feasibility and cost, and so would provide a reasonable margin of safety beyond the risk-based level considered protective.

[12]   EPA published the final rule at 69 FR 394, January 5, 2004.

establishing the mechanisms by which this demonstration can be made, such demonstrations yielding a site-specific limit for total chlorine.)[13] The rule would also establish two ways by which you could make this demonstration: by a look-up table analysis or by a site-specific compliance demonstration (as explained below). The look-up table is much simpler to use, but establishes emission rates that are quite conservative because there are few site-specific parameters considered and therefore the model's default assumptions are conservative. If you elect not to comply with those conservative emission rates, you may perform a site-specific compliance demonstration.

The look-up table identifies the total chlorine emission limit in terms of a toxicity-weighted HCl-equivalent emission rate. Under the site-specific compliance demonstration alternative, the total chlorine limit would also be expressed as a toxicity weighted HCl-equivalent emission rate even though you would model emissions of hydrogen chloride and chlorine gas from each on-site hazardous waste combustor.   We define the toxicity-weighted HCl-equivalent emission rate below.

1.   Toxicity-Weighted HCl-Equivalent Emission Rates

Although the MACT emission standards for total chlorine are expressed as a stack gas emission concentration--ppmv--we must use an emission rate (e.g., lb/hr) format for risk-based standards. This is because health and environmental risk is related to the mass rate of emissions over time.

In addition, we propose to use a toxicity-weighted HCl-equivalent emission rate (HCl-equivalents) as the metric for the combined emissions of hydrogen chloride and chlorine gas. The HCl-equivalent emission rate considers the RfCs of hydrogen chloride and chlorine gas when calculating the combined emission rate according to this equation:

$$ER_{tw} = \sum(ER_i \ x \ (RfC_{HCl}/RfC_i))$$

where:

ER_{tw} is the HC1-equivalent emission rate, lb/hr
ER_i is the emission rate of HAP i in lbs/hr
RfC_i is the reference concentration of HAP i
RfC_{HCl} is the reference concentration of HCl

Expressing the risk-based emission limit as HCl-equivalents enables you to use the equation to apportion the emission rate limit between hydrogen chloride and chlorine gas as you choose. Thus, you need to be concerned with ensuring compliance with the HCl-equivalent emission rate only, rather than with emission rates for hydrogen chloride and chlorine gas individually.

Under the look-up table analysis discussed below, you would use the hydrogen chloride and chlorine gas emission rates you choose for each on-site hazardous waste combustor to calculate the HCl-equivalent emission rate for the combustor. You would sum the HCl-equivalent

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[13]   Rather than establishing emission rate limits for hydrogen chloride and chlorine gas, or for total chlorine, for each combustor, you would actually establish an HCl-equivalent emission rate limit for each combustor, as discussed below in the text.

emission rates for your hazardous waste combustors. If you elect to use the site-specific compliance demonstration to document eligibility, you would model emission rates of hydrogen chloride and chlorine gas that you choose for each on-site hazardous waste combustor to document that the facility Hazard Index is less than or equal to 1.0. You would then use the hydrogen chloride and chlorine gas emission rates you model to establish an HCl-equivalent emission rate limit for each combustor.

> 2.   How Would You Conduct a Look-Up Table Analysis?

You would sum the HCl-equivalent rates for all combustors, and compare the sum to the appropriate allowable emission rate in Table 1 of proposed §63.1215. Emission rates are provided as a function of stack height and distance to the nearest property boundary. If you have more than one hazardous waste combustor at your facility, you would use the average value for stack height (i.e., the averaged stack heights of the different hazardous waste combustors at your facility), and the minimum distance between any hazardous waste combustor stack and the property boundary.[14]

If one or both of these values for stack height and distance to nearest property boundary do not match the exact values in the look-up table, you would use the next lowest table value. This would ensure that the HCl-equivalent emission rate limits are protective.

You would not be eligible for the look-up table analysis if your facility is located in complex terrain because the plume dispersion models used to calculate the emission rates are not applicable to sources in complex terrain.

You would be eligible to comply with the risk-based alternative HCl-equivalent emission rate limits you calculate for each combustor if the facility HCl-equivalent emission rate limit (i.e., the sum of the HCl-equivalent emission rates for all hazardous waste combustors) does not exceed the appropriate value specified in the look-up table. Please note, however, that we also propose to cap the HCl-equivalent emission rate limits for incinerators, cement kilns, and lightweight aggregate kilns at a level that ensures that the current total chlorine emission standards are not exceeded. See discussion below in Section D.

Please note that the emission rates provided in Table 1 are different from those provided for industrial boilers in the Industrial Boiler and Process Heater MACT rule recently promulgated. This is because the key parameters used by the SCREEN3 atmospheric dispersion model to predict the normalized air concentrations that EPA used to establish HCl-equivalent emission rates as a function of stack height and distance to property boundary for industrial boilers--stack

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[14]   HCl production furnaces are not eligible for the risk-based total chlorine emission limits because we are proposing that the MACT standard for total chlorine would be used as a surrogate to control metal HAP. Nonetheless, if you operate an HCl production furnace at a facility where you would establish risk-based emission limits for total chlorine for other hazardous waste combustors, you would account for total chlorine emissions from the HCl production furnace in your risk-based eligibility demonstration for the other combustors. If, for example, you use the look-up table to demonstrate eligibility, you would include the stack height of the HCl production furnace in the calculation of average stack height for your combustors, and you would consider whether the HCl production furnace stack is the closest hazardous waste combustor stack to the property boundary.

diameter, stack exit gas velocity, and stack exit gas temperature--are substantially different for hazardous waste burning incinerators, cement kilns, and lightweight aggregate kilns. Thus, the maximum HCl-equivalent emission rates for hazardous waste combustors would generally be lower than those EPA established for industrial boilers.

To ensure that the HCl-equivalent emission rate limits in a look-up table analysis for hazardous waste combustors would not result in a Hazard Index of more than 1.0, we propose to establish limits based on the maximum annual average normalized air concentrations in US EPA, "A Tiered Modeling Approach for Assessing the Risk Due to Sources of Hazardous Air Pollutants," March 1992, Table 1. Those normalized air concentrations are based on conservative simulations of toxic pollutant sources with Gaussian plume dispersion models. The simulations are conservative regarding factors such as meteorology, building downwash, plume rise, etc.

We specifically request comment on whether the HCl-equivalent emission rates in Table 1 are too conservative and thus have limited utility because they apply to all hazardous waste combustors generically. Alternatively, we could establish less conservative emission rates in look-up tables specific to various classes of hazardous waste combustors (e.g., cement kilns, incinerators) that have similar stack properties that affect predicted emissions. We request comment on whether industry stakeholders would be likely to use the proposed look-up table eligibility demonstration or revised look-up tables tailored to specific classes of hazardous waste combustors, in lieu of the site-specific compliance eligibility demonstration.

3.   How Would You Conduct a Site-Specific Compliance Demonstration?

If you fail to demonstrate that your facility is able to comply with the alternative risk-based emission limit using the look-up table approach, you may choose to perform a site-specific compliance demonstration. We are proposing that you may use any scientifically-accepted peer-reviewed risk assessment methodology for your site-specific compliance demonstration. An example of one approach for performing the demonstration for air toxics can be found in the EPA's "Air Toxics Risk Assessment Reference Library, Volume 2, Site-Specific Risk Assessment Technical Resource Document,", which may be obtained through the EPA's Air Toxics Website at www.epa.gov/ttn/atw.

Your facility would be eligible for the alternative risk-based total chlorine emission limit if your site-specific compliance demonstration shows that the maximum Hazard Index for hydrogen chloride and chlorine gas emissions from all on-site hazardous waste combustors at a location where people live (i.e., the maximum <u>actual</u> most exposed individual) is less than or equal to 1.0, rounded to the nearest tenths decimal place (0.1).[15] You would estimate long-term inhalation exposures for this individual most exposed to the facility's emissions through the estimation of annual or multi-year average ambient concentrations. You would use site-specific, quality-assured data wherever possible, and health-protective default assumptions wherever site-specific data are not available. You would document the data and methods used for the assessment so

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[15]   When calculating Hazard Index values, the final HI value should be rounded to one decimal place given the uncertainties in the analyses. For example, an HI calculated to be 0.94 would be presented as 0.9, while an HI calculated to be 0.96 would be presented as 1.0 (which would pass the eligibility demonstration). Intermediate calculations should use as many significant figures as appropriate.

that it is transparent and can be reproduced by an experienced risk assessor and emissions measurement expert.

Your site-specific compliance demonstration need not assume any attenuation of exposure concentrations due to the penetration of outdoor pollutants into indoor exposure areas. In addition, we are proposing that the demonstration need not assume any reaction or deposition of hydrogen chloride and chlorine gas from the emission point to the point of exposure. In particular, you would assume that chlorine gas is not photolyzed to hydrogen chloride, as discussed in Section B.1 above.

If your site-specific compliance demonstration documents that the maximum Hazard Index from your hazardous waste combustors is less than or equal to 1.0, you would establish a maximum HCl-equivalent emission rate limit for each combustor using the hydrogen chloride and chlorine gas emission rates you modeled in the site-specific compliance demonstration. Please note, however, that we also propose to cap the HCl-equivalent emission rate limits for incinerators, cement kilns, and lightweight aggregate kilns at a level that ensures that the current total chlorine emission standards are not exceeded. See discussion below in Section D.

D.   What Is the Rationale for Caps on the Risk-Based Emission Limits?

The HCl-equivalent emission rate limits would be capped for incinerators, cement kilns, and lightweight aggregate kilns at a level that ensures total chlorine emissions do not exceed the interim standards provided by §§ 63.1203, 63.1204, and 63.1205. These caps on the risk-based emission limits would ensure that emission levels do not increase above the emission levels that sources are currently required to achieve, thus precluding "back-sliding." Given the discretionary nature of section 112 (d) (4), and the general purpose of the section 112 (d) standard-setting process to lock-in performance of current emission control technology, we think it appropriate to invoke the provision in a manner that does not result in emission increases over current regulatory levels.

We considered whether to propose emission caps for boilers at the levels allowed by the RCRA emission standards under § 266.107 but conclude that this would be inappropriate. This is because the RCRA emission standards are also risk-based standards but are based on risk criteria that we considered appropriate in 1987 when we proposed those rules. The risk criteria we propose today are substantially different from those used to implement § 266.107. For example, the RfC for hydrogen chloride is higher now while the RfC for chlorine gas is lower. In addition, we considered a Hazard Index of 0.25 acceptable under the RCRA rule, while we propose today a Hazard Index limit of less than or equal to 1.0. Because the risk criteria for the current RCRA rules are substantially different from the risk criteria we propose today for invoking Section 112(d)(4), we do not believe it is appropriate to use the RCRA standards as a cap for establishing risk-based standards under Section 112(d)(4).

Capping risk-based emission limits for incinerators, cement kilns, and lightweight aggregate kilns at an HCl-equivalent emission rate corresponding to the MACT interim standards would not increase compliance costs (by definition). Thus, the cap would help ensure that emissions are protective of public health with an ample margin of safety, and that there are no significant adverse environmental impacts.

To implement the cap, you would ensure that the hydrogen chloride and chlorine gas emission rates you use to calculate the HCl-equivalent emission rate for incinerators, cement kilns,

and lightweight aggregate kilns would not result in total chlorine emission concentrations exceeding the standards provided by §§ 63.1203, 63.1204, and 63.1205.

E.   What Would Your Risk-Based Eligibility Demonstration Contain?

To enable regulatory officials to review and approve the results of your risk-based demonstration, you would include the following information, at a minimum: (1) identification of each hazardous waste combustor combustion gas emission point (e.g., generally, the flue gas stack); (2) the maximum capacity at which each combustor will operate, and the maximum rated capacity for each combustor, using the metric of stack gas volume emitted per unit of time, as well as any other metric that is appropriate for the combustor (e.g., million Btu/hr heat input for boilers; tons of dry raw material feed/hour for cement kilns); (3) stack parameters for each combustor, including, but not limited to stack height, stack area, stack gas temperature, and stack gas exit velocity; (4) plot plan showing all stack emission points, nearby residences, and property boundary line; (5) identification of any stack gas control devices used to reduce emissions from each combustor; (6) identification of the RfC values used to calculate the HCl-equivalent emissions rate; (7) calculations used to determine the HCl-equivalent emission rate as prescribed above; (8) for incinerators, cement kilns, and lightweight aggregate kilns, calculations used to determine that the HCl-equivalent emission rate limit for each combustor does not exceed the standards for total chlorine at §§ 63.1203, 63.1204, and 63.1205; and (9) the HCl-equivalent emission rate limit for each hazardous waste combustor that you will certify in the Documentation of Compliance required under § 63.1211(d) that you will not exceed, and the limits on the operating parameters specified under § 63.1209(o) that you will establish in the Documentation of Compliance.

If you use the look-up table analysis to demonstrate that your facility is eligible for the risk-based alternative for the total chlorine emission limit, your eligibility demonstration would also contain, at a minimum, the following: (1) calculations used to determine the average stack height of on-site hazardous waste combustors; (2) identification of the combustor stack with the minimum distance to the property boundary of the facility; (3) comparison of the values in the look-up table to your maximum HCl-equivalent emission rate.

If you use a site-specific compliance demonstration to demonstrate that your facility is eligible for the risk-based alternative for the total chlorine emission limit, your eligibility demonstration would also contain, at a minimum, the following: (1) identification of the risk assessment methodology used; (2) documentation of the fate and transport model used; and (3) documentation of the fate and transport model inputs, including the stack parameters listed above converted to the dimensions required for the model. In addition, you would include all of the following that apply: (1) meteorological data; (2) building, land use, and terrain data; (3) receptor locations and population data; and (4) other facility-specific parameters input into the model. Your demonstration would also include: (1) documentation of the fate and transport model outputs; (2) documentation of any exposure assessment and risk characterization calculations; and (3) documentation of the predicted Hazard Index for HCl-equivalents and comparison to the limit of less than or equal to 1.0.

F.   When Would You Complete and Submit Your Eligibility Demonstration

You would be required to submit your eligibility demonstration to the permitting authority

for review and approval.[16] In addition you would submit an electronic copy of the demonstration to REAG@EPA.GOV (preferably) or a hard copy to: U.S. EPA, Risk and Exposure Assessment Group, Emission Standards Division (C404-01), Attn: Group Leader, Research Triangle Park, North Carolina 27711.

Requiring prior approval of these eligibility demonstrations is warranted because hazardous waste combustor may feed chlorine at high feedrates which may result in emissions of hydrogen chloride and chlorine gas that approach or exceed the RfCs (i.e., absent compliance with either the MACT standards or the section 112(d)(4) risk-based standards). Thus, prior approval of alternative HCl-equivalent emission rate limits is warranted to ensure that emissions are protective with an ample margin of safety.

1.   Existing Sources

If you operate an existing source, you must be in compliance with the emission standards on the compliance date. Consequently, if you elect to comply with the alternative risk-based emission rate limit for total chlorine, you must have completed the eligibility demonstration and received approval from your delegated permitting authority by the compliance date.

You would submit documentation supporting your eligibility demonstration not later than 12 months prior to the compliance date.

Your permitting officials will notify you of approval or intent to disapprove your eligibility demonstration within 6 months after receipt of the original demonstration, and within 3 months after receipt of any supplemental information that you submit. A notice of intent to disapprove your eligibility demonstration will identify incomplete or inaccurate information or noncompliance with prescribed procedures and specify how much time you will have to submit additional information. If your permitting authority has not approved your eligibility demonstration to comply with a risk-based HCl-equivalent emission rate(s) by the compliance date, you must comply with the MACT emission standards for total chlorine gas under §§ 63.1203A, 63.1204(A), 63.1205A, 63.1216, and 63.1217.[17]

2.   New Sources

If you operate a source that is not an existing source and that becomes subject to Subpart EEE, you must comply with the MACT emission standards for total chlorine unless and until your eligibility demonstration has been approved by the permitting authority.

If you operate a new or reconstructed source that starts up before the effective date of the emission standards proposed today, or a solid fuel-fired boiler or liquid fuel-fired boiler that is an

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[16] Since the Title V permitting authority is delegated to States in virtually all instances, the permit limit would thus be issued as a matter of State authority (generally in parallel with a delegation of Section 112 authority pursuant to CAA Section 112(l)), and be reviewable only in State courts.

[17]   Please note that, if your eligibility demonstration is not approved prior to the compliance date, a request to extend the compliance date to enable you to undertake measures to comply with the MACT standards for total chlorine will not be approved unless you made a good faith effort to submit a complete, accurate, and timely eligibility demonstration and to respond to concerns raised by the permitting authority or U.S. EPA.

area source that increases its emissions or its potential to emit such that it becomes a major source of HAP before the effective date of the emission standards proposed today (and thus becomes subject to emission standards applicable to major sources, including the standard for total chlorine), you would be required to comply with the emission standards under §§ 63.1216 and 63.1217 until your eligibility demonstration is completed, submitted, and approved by your permitting authority.

If you operate a new or reconstructed source that starts up after the effective date of the emission standards proposed today, or a solid fuel-fired boiler or liquid fuel-fired boiler that is an area source that increases its emissions or its potential to emit such that it becomes a major source of HAP after the effective date of the emission standards proposed today (and thus becomes subject to emission standards applicable to major sources including the standard for total chlorine), you would be required to comply with the emission standards under §§ 63.1216 and 63.1217 until your eligibility demonstration is completed, submitted, and approved by your permitting authority.

G.   How Would the Risk-Based HCl-Equivalent Emission Rate Limit Be Implemented?

Upon approval by the permitting authority of your eligibility demonstration, the HCl-equivalent emission rate limit established in the demonstration for your hazardous waste combustor(s) becomes the applicable emission limit for total chlorine in lieu of the MACT standard for total chlorine.

1.   What Are the Testing and Monitoring Requirements?

To ensure compliance with the alternative HCl-equivalent emission rate limit for your combustor(s), you would conduct performance testing as required for the MACT standards and establish limits on the same operating parameters that apply to sources complying with the MACT standards for total chlorine under §63.1209(o). You would establish and comply with these operating parameter limits just as you would establish and comply with the limits for the MACT emission standard for total chlorine, with the exception of the chlorine feedrate limit, as discussed below. For example, existing sources would establish these limits in the Documentation of Compliance required under § 63.1211(c) and begin complying with them not later than the compliance date. Existing sources would also revise the operating limits as necessary based on the initial comprehensive performance test and begin complying with the revised operating limits not later than when the Notification of Compliance is postmarked, as required under §§ 63.1207(j) and 63.1210(b).

The limit on chlorine feedrate required under § 63.1209(o)(1) would be established differently to ensure compliance with the HCl-equivalent emission rate limit rather than the total chlorine emission standard. To ensure that facility-wide hazardous waste combustor emissions of HCl-equivalents result in exposures equivalent to a Hazard Index of less than or equal to 1.0, the feedrate limit for chlorine would be established as the average of the test run averages and the averaging period for compliance would be one year. A yearly rolling average is appropriate for risk-based emission limits rather than the 12-hour rolling average applicable to the MACT standards because the risk-based emission limit is based on chronic exposure.

As discussed in Section B.2.e above, although we conclude that the chronic exposure Hazard Index would always be higher and thus be the basis for the total chlorine emission rate limit, we still must be concerned about acute exposure attributable to short-term emission rates

higher than the maximum average emission rate limit. For example, the annual average limit on chlorine (i.e., total chlorine and chloride) feedrate would allow a source to feed very high levels of chlorine for short periods of time, potentially resulting in exceedances of the acute exposure Hazard Index based the AEGL-1 values for hydrogen chloride and chlorine gas. We specifically request comment on how a short-term limit on chlorine feedrate could be established for each hazardous waste combustor to ensure that the acute exposure Hazard Index is less than or equal to 1.0. One approach would be for you to extrapolate from the chlorine feedrate during the comprehensive performance test to the feedrate projected to achieve emission rates of hydrogen chloride and chlorine gas that result in an acute exposure Hazard Index of 1.0.[18] This feedrate would be a 1-hour average feedrate limit. This approach uses the reasonable assumption that there is a proportional relationship between chlorine feedrate and the emission rate of hydrogen chloride and chlorine gas. To extrapolate feedrates, you would consider the system removal efficiency achieved during the performance test for sources equipped with wet or dry acid gas scrubbers and for cement kilns.[19] Other sources would assume a zero system removal efficiency because any removal efficiency that may be measured would be incidental and not reproducible.

The approach discussed above would be applicable if you use the site-specific compliance eligibility demonstration. If you use the look-up table for your eligibility demonstration, an alternative approach would be needed to establish a short-term chlorine feedrate limit. One approach would be to establish a look-up table for maximum 1-hour average HCl-equivalents based on acute exposure. Acute exposure HCl-equivalents would be calculated using the AEGL-1 values for hydrogen chloride and chlorine gas, and the look-up table of acute exposure maximum emission rate limits would be based on normalized air concentrations for maximum 1-hour average ground level concentrations.[20] You would extrapolate the chlorine feedrate from the level achieved during the comprehensive performance test to a level that would not exceed the acute exposure HCl-equivalent emission rate limit for each combustor provided in the look-up table. This feedrate would be a 1-hour average feedrate limit.

We specifically request comment on these approaches to establish a short-term limit on the feedrate of total chlorine and chloride to ensure that the acute exposure Hazard Index for hydrogen chloride and chlorine gas is less than or equal to 1.0.

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[18]   We also request comment on whether extrapolation of the chlorine feedrate should be allowed to 100% of the Hazard Index limit of 1.0, or whether a more conservative approach of limited extrapolation to a fraction of the Hazard Index (e.g., 0.8) would be warranted, given the uncertainties inherent in projecting emissions from extrapolated feedrates.

[19]   We request comment on whether the system removal efficiency a cement kiln demonstrates during a performance test because of the alkalinity of the raw material is reasonably indicative of the system removal efficiency it routinely achieves (i.e., is the system removal efficiency reasonably reproducible).

[20]   We would use the normalized maximum 1-hour average concentrations in US EPA, "A Tiered Modeling Approach for Assessing the Risk Due to Sources of Hazardous Air Pollutants," March 1992, Table 2.

2.	What Test Methods Would You Use?

Although you would comply with the MACT standard for total chlorine using stack Method 26/26A, certain sources would not be allowed to use that method to demonstrate compliance with the risk-based HCl-equivalent emission rate limit.[21] Cement kilns and sources equipped with a dry acid gas scrubber should use EPA Method 320/321 or ASTM D 6735-01 to measure hydrogen chloride, and the back-half (caustic impingers) of Method 26/26A to measure chlorine gas. Incinerators, boilers, and lightweight aggregate kilns should use EPA Method 320/321 or ASTM D 6735-01 to measure hydrogen chloride, and Method 26/26A to measure total chlorine, and calculate chlorine gas by difference if: (1) the bromine/chlorine ratio in feedstreams is greater than 5 percent; or (2) the sulfur/chlorine ratio in feedstreams is greater than 50 percent.

a. Method 26/26A Has a Low Bias for Hydrogen Chloride in Certain Situations. Method 26/26A has a low bias for hydrogen chloride for sources that emit particulate matter than can adsorb hydrogen chloride: cement kilns and sources equipped with a dry acid gas scrubber. Particulate matter caught by the Method 26/26A filter scrubs hydrogen chloride from the sample gas, and can result in measurements that are biased low by 2 to 30 times.[22] Chlorine gas is not adsorbed so that chlorine gas emissions are not biased by this mechanism.

b. Method 26/26A Can Have a Low Bias for Chlorine Gas and a High Bias for Hydrogen Chloride, but Has No Bias for Total Chlorine. Method 26/26A also has a low bias for chlorine and a high bias for hydrogen chloride when bromine is present at significant levels. Bromine has a strong effect on the bias. Although the various interhalogen reactions are extremely complex and may depend on a variety of system parameters, it appears that each bromine molecule can react with a chlorine molecule in the acidic impingers of Method 26/26A where hydrogen chloride is captured, converting the chlorine to chloride ions which are reported as hydrogen chloride. Total chlorine measurements (i.e., hydrogen chloride and chlorine gas, combined, reported as HCl equivalents), however, are not affected. To minimize this bias, we propose to require sources that have a bromine/chlorine feedrate exceeding 5 percent to use alternative methods discussed below. Given the strong bias that bromine can have on M26/26A measurements, we believe a 5 percent limit on the ratio is within the range of reasonable values that we could select. We specifically request comment on this or other approaches to minimize the bromine bias.

Method 26/26A also has a low bias for chlorine and a high bias for hydrogen chloride when sulfur is present at substantial levels relative to the levels of chlorine. The capture of

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[21]	Even though Method 26/26A may bias total chlorine emission measurements low for cement kilns for reasons discussed in the text, it is appropriate to allow compliance with the technology-based MACT emission standards for total chlorine using that method. Because the MACT standards are developed using data obtained using Method 26/26A, allowing that method for compliance will achieve reductions in total chlorine emissions. For the same reason, it would be inappropriate to require compliance with unbiased methods because the average of the best performing sources might not be able to achieve the standard.

[22]	USEPA, "Draft Technical Support Document for HWC MACT Replacement Standards, Volume III: Selection of MACT Standards and Technologies," March 2004.

chlorine in the acidic impingers that collect hydrogen chloride has been shown to rapidly increase when the ratio of SO2/HCl (both expressed in ppmv) exceeds 0.5. Again, total chlorine measurements are not biased. To minimize this bias, we believe that a 50 percent limit on the ratio of the sulfur/chlorine feedrate is within the range of reasonable values that we could select. We specifically request comment on this or other approaches to minimize the sulfur dioxide bias.

c. Unbiased Methods Are Available. The Agency recently developed three methods for hydrogen chloride in the context of the Portland Cement MACT rule for purposes of area source determinations: Methods 320, 321, and 322. Although M322 (GFCIR, Gas Filter Correlation Infra-Red) is easier to use and less expensive than M320/M321 (FTIR, Fourier Transform Infra-Red), the Agency did not promulgated M322 in the final Portland Cement MACT rule because of accuracy concerns resulting from emissions sampling of lime manufacturing kilns in the context of developing the Lime Manufacturing MACT rule.

The Agency has also adopted an American Society of Testing and Materials (ASTM) standard for measuring hydrogen chloride emissions: ASTM D 6735-01. This method (and M321) is allowed for area source determinations under the Lime Manufacturing MACT rule. 69 FR 394 (Jan. 5, 2004). The method is an impinger method, like M26/26A, but with several improvements. For example, the method uses a rejection probe (i.e., the probe is directed counter to the gas flow), the filter is heated to minimize adsorption of hydrogen chloride on particulate matter that may catch on the filter, glassware must be conditioned, and improved quality assurance/quality control procedures are prescribed.

H.   How Would You Ensure that Your Facility Remains Eligible for the Risk-Based Emission Limit?

1.   Changes Over Which You Have Control

Changes in design, operation, or maintenance of a hazardous waste combustor that may affect the rate of emissions of HCl-equivalents from the combustor are subject to the requirements of § 63.1206(b)(5).

If you change the information documented in the demonstration of eligibility for the HCl-equivalent emission rate limit which is used to establish the HCl-equivalent emission rate limit, you would be subject to the following procedures.

a. Changes that Would Decrease the Allowable HCl-Equivalent Emission Rate Limit. If you plan to make a change that would decrease the allowable HCl-equivalent emission rate limit documented in your eligibility demonstration, you would comply with § 63.1206(b)(5)(i)(A-C) regarding notifying the permitting authority of the change, submitting a comprehensive performance test schedule and test plan, comprehensive performance testing, and restriction on burning hazardous waste prior to submitting a revised Notification of Compliance. An example of a change that would decrease the allowable HCl-equivalent emission rate limit is location of the property boundary closer to the nearest hazardous waste combustor stack when using the look-up table to make the eligibility demonstration.

b. Changes that Would Not Decrease the Allowable HCl-Equivalent Emission Rate Limit. If you determine that a change would not decrease the allowable HCl-equivalent emission rate limit documented in your eligibility demonstration, you would document the change in the operating record upon making such change. If the change would increase your allowable HCl-equivalent emission rate limit and you elect to establish a higher HCl-equivalent limit, you must

submit a revised eligibility demonstration for review and approval. Upon approval of the revised eligibility demonstration, you must comply with § 63.1206(b)(5)(i)(A)(2), (B), and (C) regarding submitting a comprehensive performance test schedule and test plan, comprehensive performance testing, and restriction on burning hazardous waste prior to submitting a revised Notification of Compliance.

        2.   Changes Over Which You Do Not Have Control

Over time, factors and information over which you do not have control and which you use to make your eligibility demonstration may change. For example, if you use a site-specific compliance demonstration, individuals may locate within the area impacted by emissions such that the most exposed individual may be exposed to higher ground level concentrations than previously estimated. This could lower your allowable HCl-equivalent emission rate limit. Consequently, you would be required to review the documentation you use in your eligibility demonstration every five years on the anniversary of the comprehensive performance test and submit for review with the test plan either a certification that the information used in your eligibility demonstration has not changed in a manner that would decrease the allowable HCl-equivalent emission rate limit, or a revised eligibility demonstration for a revised HCl-equivalent emission rate limit.

If you determine that you cannot demonstrate compliance with a lower allowable HCl-equivalent emission rate limit during the (subsequent) comprehensive performance test because you cannot complete changes to the design or operation of the source prior to the test, you may request that the permitting authority grant you additional time as necessary to make those changes, not to exceed three years.

I.   Request for Comment on an Alternative Approach: Risk-Based National Emission Standards

As noted earlier, another approach to implement section 112(d)(4) – and one EPA has used in past MACT rules – would be to establish national emission standards for each source category to ensure that the emissions from each source within the category are protective of public health with an ample margin of safety (and do not pose adverse environmental impacts). Under this approach, dispersion modeling of representative worst-case sources (or all sources) within a category would be used to identify an emission level that meets the section 112(d)(4) criteria for all sources within the category. Thus, the same risk-based national emission standard would be established for each source in each source category under this approach, rather than the approach we discuss above of establishing a national exposure standard based on a uniform level of protection that you would use to establish a site-specific emission limit.

The approach of establishing a risk-based national emission standard for a source category has the advantage of being less burdensome to implement both for the regulated community and regulatory authorities. ~~It is also more consistent with the idea of a uniform national standard.~~ It has the disadvantage, however, of requiring documentation "up front" to support the proposed emission standards. EPA does not have the time, data, or resources to conduct the analyses required to support this approach.

The Cement Kiln Recycling Coalition (CKRC), however, has submitted documentation

supporting a national risk-based emission standard for total chlorine for cement kilns.[23] CKRC uses normalized air concentrations from ISC-PRIME and ISCST3 to estimate maximum annual average and maximum 1-hour average off-site ground level concentrations of hydrogen chloride and chlorine gas for each source. CKRC assumes that each kiln emits total chlorine at 130 ppmv, the current Interim Standard, and that emissions of hydrogen chloride and chlorine gas partition at the same ratio as measured during the most recent compliance test. The analysis indicates that the facility Hazard Index for 1-hour exposures was below 0.2 for the kilns at all facilities, and the facility Hazard Index for long-term exposures was below 0.2 for the kilns at 8 of 14 facilities. Emissions from kilns at the remaining 6 facilities can potentially result in facility Hazard Index values up to 0.7.

Notwithstanding that CKRC followed the guidance we suggested to identify a section 112(d)(4) risk-based emission standard for a source category, we conclude that establishing a stack gas concentration-based total chlorine standard of 130 ppmv may not be protective with an ample margin of safety. Even though the highest Hazard Index for any facility in the category is below the maximum HI of less than 1.0, the Hazard Index value for a facility could increase even though sources do not exceed an emission standard of 130 ppmv. This is because the Hazard Index is affected by the mass emission rate (e.g., lb/hr) of hydrogen chloride and chlorine gas individually. Thus the Hazard Index could increase from the values CKRC has calculated even though each source complies with a 130 ppmv total chlorine emission standard given that: (1) the RfC for chlorine gas is 100 times lower than the RfC for hydrogen chloride; (2) the partitioning of total chlorine between hydrogen chloride and chlorine gas could change so that a greater portion is emitted as chlorine; and (3) the mass emission rate of hydrogen chloride and chlorine gas would increase if the stack gas flowrate increases.

Because of these concerns, the more appropriate metric for a risk-based standard for total chlorine would be the toxicity-weighted HCl-equivalent emission rate discussed above in Section C.1.

To achieve our dual objective of establishing a protective risk-based emission standard expressed as a toxicity-weighted HCl-equivalent emission rate (lb/hr) and ensuring that the standard does not allow total chlorine emission concentrations (ppmv) higher than the current interim standard of 130 ppmv, we propose that an HCl-equivalent emission rate limit be established that is achievable by all cement facilities. This would be an HCl-equivalent emission rate for which on-site cement kiln emissions of hydrogen chloride and chlorine gas do not exceed a Hazard Index of 1.0. To make this determination, facilities would assume that emissions of hydrogen chloride and chlorine gas partition at the same ratio as measured during the most recent compliance test. Finally, the HCl-equivalent emission rate limit would be capped, if necessary, at a limit that ensures that total chlorine concentrations for each kiln do not exceed 130 ppmv..

If this information and supporting documentation is provided to us, we would promulgate a toxicity-weighted HCl-equivalent emission rate that would be applicable to cement kilns.

On a related matter, we evaluated whether using hydrogen chloride and chlorine gas emissions data obtained with stack sampling Method 26/26A to project hydrogen chloride and

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[23]   Trinity Consultants, "Analysis of HCl/|Cl2 Emissions from Cement Kilns for 112(d)(4) Consideration in the HWC MACT Replacement Standards," September 17, 2003.

chlorine gas emissions in CKRC's analysis compromised the results. Method 26/26A is known to underestimate hydrogen chloride emissions from cement kilns.[24] We discuss above in Section F.2 concerns about Method 26/26A and the rationale for proposing to require sources to use methods other than Method 26/26A to measure emissions of hydrogen chloride and chlorine gas for compliance with risk-based standards. Briefly, Method 26/26A results for hydrogen chloride are biased low for cement kilns, although results for chlorine gas are unaffected. Even though CKRC used Method 26A results to apportion the 130 ppmv total chlorine assumed emissions between hydrogen chloride and chlorine gas for each source, the calculated Hazard Index values are not compromised. Given that the hydrogen chloride emission levels are biased low, the chlorine gas/hydrogen chloride ratio that CKRC used to apportion the 130 ppmv total chlorine emissions between chlorine gas and hydrogen chloride emissions for each source is biased high. Thus, CKRC projected chlorine gas emissions that are biased high and hydrogen chloride emissions that are biased low. These biases result in calculating conservative (i.e., higher than actual) Hazard Index values because the health threshold values are lower for chlorine gas than for hydrogen chloride.[25] Thus, actual Hazard Index values at an emission level of 130 ppmv total chlorine would be lower than those that CKRC calculated.

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[24] See 63 FR at 14196 (March 24, 1998).

[25] For the same reasons, HCl-equivalent emission rates that CRRC may use in an eligibility demonstration for the source category would be biased conservatively high.

Attachment B
WASTE MINIMIZATION BENEFITS

As discussed in Chapter 5, all commercial combustion facilities that remain in operation will experience increased costs under the MACT standards. To protect their profits, combustion facilities will have an incentive to pass these increased costs on to their customers in the form of higher combustion prices. In 1999 we conducted a waste minimization analysis to inform the expected price change under the 1999 (and later the 2002 interim) standards. Based on the results of this analysis, we estimated that as much as 240,000 tons of waste might be reallocated to waste minimization alternatives in response to higher combustion prices.[26] Since the publication of the 1999 *Assessment*, however, approximately 100,000 tons of waste have already been reallocated. In addition, given the current pricing structure of the hazardous waste combustion market, the costs of waste minimization alternatives in the short term generally exceed the cost of combustion.[27] When the additional costs of compliance with the MACT standards are taken into account, waste minimization alternatives still tend to exceed the higher combustion costs. This inelasticity in the demand for combustion suggests that in the short term large reductions in waste quantities are not likely.

While, short-tern options for waste-minimization may be limited it is likely that over the longer term (e.g. as production systems are updated) companies will continue to seek alternatives to expensive waste-management (e.g., source reduction). To the extent that increases in combustion prices provide additional incentive to adopt more efficient processes, the proposed HWC MACT replacement standard may contribute to the longer term process based waste minimization efforts. However, we are not able to isolate and quantify the specific impact of the proposed HWC MACT replacement standards on source reduction decisions.

No waste minimization impacts are captured in the quantitative analysis of costs and benefits presented in this Assessment. A quantitative assessment of the benefits associated with waste minimization at the source may result in double-counting of some of the benefits described earlier in this chapter. For example, waste minimization may further reduce emissions of hazardous air pollutants and therefore have a positive effect on public health. Emissions reductions beyond those necessary for compliance with the replacement standards are also not addressed in this benefits assessment. In addition, waste minimization is likely to result in specific types of benefits not captured in this Assessment. For example, waste generators that engage in

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[26] U.S. Environmental Protection Agency, *Addendum to the Assessment of the Potential Costs, Benefits, and Other Impacts of the Hazardous Waste Combustion MACT Standards: Final Rule*, July 23, 1999.

[27] In the long-term, waste minimization may take place as companies upgrade manufacturing processes. However, increased waste management costs are only one factor in these larger decisions. We therefore do not anticipate that the replacement standards would cause a significant change in the quantity of waste combusted.

waste minimization will experience a reduction in their waste handling costs and could also reduce the risk related to waste spills and waste management. The cost of implementing waste minimization technology has not been assessed in this analysis. These costs are likely to at least partially offset corresponding benefits.

Attachment C.

<u>Benefits from Reduced Exposure to Particulate Matter</u>

Epidemiological studies have linked PM (alone or in combination with other air pollutants) with a series of health effects.[28] PM can accumulate in the respiratory system and aggravate health problems such as asthma, or it can penetrate deep into the lungs and lead to even more serious health problems. These health effects include premature death, respiratory symptoms and disease, diminished lung function, and weakened respiratory tract defense mechanisms. Children, the elderly, and people with cardiopulmonary disease, such as asthma, are most at risk from these health effects.

To assess benefits from reduced exposure to particulate matter in 1999, we first estimated the number of excess mortality and hospital admissions in the baseline and under various 1999 MACT standard scenarios. We then subtracted the number of cases post-MACT from the number of cases in the baseline to determine potential avoided deaths and hospital admissions. Hospital admissions are associated with respiratory illness and cardiovascular disease. For the current assessment we scaled the cases found in the 1999 *Assessment* to reflect current conditions and emission reductions achieved by the proposed HWC MACT replacement standards.

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[28] The benefits discussion that follows in the rest of this paragraph is adapted from EPA, *Regulatory Impact Analysis of the Final Industrial Boilers and Process Heaters NESHAP: Final Report*, February 2004.

Exhibit 6-2		
SUMMARY OF MORTALITY VALUATION ESTIMATES		
Study	**Type of Estimate**	**Valuation (millions 2002$)**
Kneisner and Leeth (1991) (US)	Labor Market	0.80
Smith and Gilbert (1984)	Labor Market	0.92
Dillingham (1985)	Labor Market	1.26
Butler (1983)	Labor Market	1.49
Miller and Guria (1991)	Contingent Value	1.61
Moore and Viscusi (1988a)	Labor Market	3.33
Viscusi, Magat, and Huber (1991b)	Contingent Value	3.67
Marin and Psacharopoulos (1982)	Labor Market	3.78
Gegax et al. (1985)	Contingent Value	4.47
Kneisner and Leeth (1991) (Australia)	Labor Market	4.47
Gerking, de Haan, and Schulze (1988)	Contingent Value	4.59
Cousineau, Lacroix, and Girard (1988)	Labor Market	4.82
Jones-Lee (1989)	Contingent Value	5.16
Dillingham (1985)	Labor Market	5.27
Viscusi (1978, 1979)	Labor Market	5.50
R.S. Smith (1976)	Labor Market	6.19
V.K. Smith (1976)	Labor Market	6.31
Olson (1981)	Labor Market	6.99
Viscusi (1981)	Labor Market	8.83
R.S. Smith (1974)	Labor Market	9.75
Moore and Viscusi (1988a)	Labor Market	9.86
Kneisner and Leeth (1991) (Japan)	Labor Market	10.20
Herzog and Schlottman (1987)	Labor Market	12.27
Leigh and Folson (1984)	Labor Market	13.07
Leigh (1987)	Labor Market	13.99
Gaten (1988)	Labor Market	18.23
Source: Viscusi, W. Kip. *Fatal Tradeoffs: Public and Private Responsibilities for Risk*. New York: Oxford University Press, 1992, as cited in U.S. EPA, *Assessment of the Potential Costs, Benefits, and Other Impacts of the Hazardous Waste Combustion MACT Standards: Final Rule*, Office of Solid Waste, July 1999.		

In addition to avoided illnesses and deaths, benefits of reduced PM emissions include valuation of work loss days and mild restricted activity days (MRAD). To assess benefits from reduced particulate matter exposure, we first estimated the number of excess mortality cases, cases of illnesses, restricted activity days, and work loss days in the baseline. We then estimate the number of cases under four MACT standards: Option 1 Floor, Option 2 Floor, Option 3 Floor,

and Agency Preferred Approach. To determine potential benefits for each option, we then subtract the number of post-MACT cases from the number of baseline cases. We estimated benefits based on the dollar value associated with the following health conditions:

respiratory illness,
upper respiratory symptoms,
lower respiratory symptoms,
chronic bronchitis,
acute bronchitis,
cardiovascular disease,
work loss days, and
mild restricted activity days (MRAD).[29]

For avoided deaths, we assign monetary values in the same way as for avoided cancer cases, using a range of estimates for the statistical value of a life (see discussion above). For the avoided illnesses listed above, we estimate the avoided costs of hospital admissions for each of the health effects associated with exposure to particulate matter. To value the morbidity risk reductions, we multiply the expected number of annual reductions in hospital admissions for each ailment by the cost of illness for that condition, as shown in Exhibit 6-3. The estimated cost of each illness includes the hospital charge, the costs of associated physician care, and the opportunity cost of time spent in the hospital.[30] Since these estimates do not include post-hospital costs or pain and suffering

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[29] Work loss days and mild restricted activity days do not necessarily affect a worker's income and do not generally require hospitalization. It does, however, result in lost economic productivity and consequently, a loss to society.

[30] These estimates come from the following source: U.S. Environmental Protection Agency, *The Benefits and Costs of the Clean Air Act, 1970 to 1990*, October 1997, I11-I12. Estimates for COPD and physician charges for the remaining four illnesses come from Abt Associates, Incorporated, *The Medical Costs of Five Illnesses Related to Exposure to Pollutants,* Prepared for U.S. EPA, Office of Pollution Prevention and Toxics, Washington, DC, 1992, as cited in U.S. EPA, *Assessment of the Potential Costs, Benefits, and Other Impacts of the Hazardous Waste Combustion MACT Standards: Final Rule*, Office of Solid Waste, July 1999. Hospital charge estimates for the remaining illnesses are from A. Elixhauser, R.M. Andrews, and S. Fox, Agency for Health Care Policy and Research (AHCPR), Center for General Health Services Intramural Research, U.S. Department of Health and Human Services, *Clinical Classifications for Health Policy Research: Discharge Statistics by Principal Diagnosis and Procedure,* 1993, as cited in U.S. EPA, *Assessment of the Potential Costs, Benefits, and Other Impacts of the Hazardous Waste Combustion MACT Standards: Final Rule*, Office of Solid Waste, July 1999; Pope, C.A., III, D.W. Dockery, J.D. Spengler, and M.E. Raizenne. 1991. Respiratory Health and PM10 pollution: a Daily Time Series Analysis. American Review of Respiratory Diseases. 144: 668-674, as cited in U.S. EPA, *Draft Regulatory Impact Analysis: Control of Emission from Nonroad Diesel Engines*, Assessment and Standards Division, April

of the afflicted individuals, the cost of illness estimates may understate benefits.

Exhibit 6-3	
AVOIDED COST OF CASES ASSOCIATED WITH PM	
Illness	**Estimated Cost Per Incidence (2002 $)**
Respiratory Illness[1]	$9,011
Upper respiratory symptoms[2]	$27
Lower respiratory symptoms[3]	$18
Chronic bronchitis[4]	$377,229
Acute bronchitis[5]	$55
Cardiovascular disease[1]	$15,018
Work loss days (cost per day)[1]	$112
Minor restricted activity days (cost per day)[1]	$39

2003; Schwartz J.,and Nease L.M., 2000. Fine Particles are more strongly associated than coarse particles with acute respiratory health effects in schoolchildren. Epidemiology. 11L 6-10, as cited in U.S. EPA, *Draft Regulatory Impact Analysis: Control of Emission from Nonroad Diesel Engines*, Assessment and Standards Division, April 2003; Schwartz J., Dockery, D.W., Nease, L.M., Wypij, D., Ware, J.H., Spengler, J.D., Koutrakis, P.,Speizer, F.E., and Ferris, Jr., B.G. 1994. Acute Effects of Summer Air Pollution on Respiratory Symptom Reporting in Children. American Journal of Respiratory Critical Care Medicine. 150. 1234-1242, as cited in U.S. EPA, *Draft Regulatory Impact Analysis: Control of Emission from Nonroad Diesel Engines*, Assessment and Standards Division, April 2003; and Dockery, D.W., J. Cunningham, A.I. Damokosh, L.M. Neas, J.D. Spengler, P. Koutrakis, J.H. Ware, M. Raizenne, and F.R. Speizer. 1996. Health Effects of Acid Aerosols on North American Children-Respiratory Symptoms. Enviromental Health Perspectives. 104(5)" 500-505.

Sources:

[1] U.S. Environmental Protection Agency, *The Benefits and Costs of the Clean Air Act, 1970 to 1990*, October 1997, I11-I12

[2] Pope, C.A., III, D.W. Dockery, J.D. Spengler, and M.E. Raizenne. 1991. Respiratory Health and PM10 pollution: a Daily Time Series Analysis. American Review of Respiratory Diseases. 144: 668-674, as cited in U.S. EPA, *Draft Regulatory Impact Analysis: Control of Emission from Nonroad Diesel Engines*, Assessment and Standards Division, April 2003.

[3] Average of Schwartz J.,and Nease L.M., 2000. Fine Particles are more strongly associated than coarse particles with acute respiratory health effects in schoolchildren. Epidemiology. 11L 6-10, as cited in U.S. EPA, *Draft Regulatory Impact Analysis: Control of Emission from Nonroad Diesel Engines*, Assessment and Standards Division, April 2003; and Schwartz J., Dockery, D.W., Nease, L.M., Wypij, D., Ware, J.H., Spengler, J.D., Koutrakis, P.,Speizer, F.E., and Ferris, Jr., B.G. 1994. Acute Effects of Summer Air Pollution on Respiratory Symptom Reporting in Children. American Journal of Respiratory Critical Care Medicine. 150. 1234-1242, as cited in U.S. EPA, *Draft Regulatory Impact Analysis: Control of Emission from Nonroad Diesel Engines*, Assessment and Standards Division, April 2003.

[4] U.S. EPA, *Benefits of the Proposed Inter-State Air Quality Rule*, January 2004.

[5] Neumann, J.E., M.T. Dickie, and R.E. Unsworth. 1994. Industrial Economics, Incorporated. Memorandum to Jim DeMocker, U.S. EPA, Office of Air and Radiation. Linkage Between Health Effects Estimation and Morbidity Valuation in the Section 812 Analysis -- Draft Valuation Document. March 31.

Note: Cardiovascular disease is assumed to be Ischemic heart disease.

Attachment D

<u>Benefits from Reduced Exposure to Mercury</u>

Reduced mercury emissions under the proposed replacement standards may generate a range of human health benefits.[31] A reduction in mercury emissions is likely to reduce the deposition of mercury in lakes, rivers, and streams, which will subsequently reduce bioaccumulation of methylmercury in fish. Since consumption of fish contaminated by methylmercury can cause adverse health effects, reductions in the bioaccumulation of methylmercury in fish could lead to human health benefits.

When humans consume fish contaminated with methylmercury, the ingested methylmercury is absorbed into the blood and distributed to tissue throughout the body. In pregnant women, methylmercury can be passed on to the developing fetus, leading to a number of neurological disorders in children. These disorders can lead to learning disabilities and retarded development, which may lead to later adverse economic consequences. The effects of prenatal exposure can occur at doses that do not affect the mother. In addition, children who consume fish contaminated by methylmercury may develop neurological disorders, which may lead to other adverse economic effects. A more detailed description of the benefits associated with reduced mercury exposure is presented in EPA's regulatory impact analysis of the non-hazardous boiler MACT standards.[32]

The 1999 *Assessment* considered benefits from reduced exposure to mercury. The 1999 standards were expected to reduce mercury emissions by four tons per year; the replacement standards are expected to reduce mercury emissions by about one ton per year (Exhibit 6-5). This *Assessment* provides no quantification of health benefits associated with the reduction of mercury emissions due to compliance with the replacement standards. However, it does provide a discussion of the benefits estimated in the 1999 *Assessment*. The *Assessment* noted that recreational anglers exposed to mercury above levels of concern are potentially at risk for bearing children with cognitive abnormalities.[33] The birth rate of the general population indicates that

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[31] The benefits discussion that follows in the rest of this paragraph is adapted from EPA, *Regulatory Impact Analysis of the Final Industrial Boilers and Process Heaters NESHAP: Final Report*, February 2004. Additional information related to the health effects associated with mercury are provided in chapter 9 of this report.

[32] EPA, *Regulatory Impact Analysis of the Final Industrial Boilers and Process Heaters NESHAP: Final Report*, February 2004.

[33] Given the current state of scientific knowledge, there is uncertainty associated with modeling mercury concentrations in fish.

1.67 percent of recreational anglers potentially at risk will have children in a given year.[34] This estimate also may understate benefits because it does not include avoided pain and suffering.

It is important to note that the approach used in the 1999 *Assessment* uses upper bound estimates of the population at risk to compute benefits for mercury. For the 1999 *Assessment* the cost of developmental abnormalities was applied to all recreational anglers *potentially* at risk (e.g., those exposed to mercury above levels of concern (HQ>1)). This approach did not allow us to say anything about the likelihood of an adverse effect for the anglers at risk; the analysis could only say that the Agency could not rule out adverse impacts for these individuals. Subsistence fishermen, (i.e., those individuals who obtain a significant portion of their dietary fish intake from their own fishing activities), also faced the potential risk of bearing children with developmental abnormalities as a result of higher mercury exposures through their daily fish consumption.

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[34] U.S. Department of Commerce, Bureau of the Census, *Statistical Abstract of the United States 1995*, 115th ed., 73.