Attachment 1

COMMENTS ON THE EXPANSION OF THE RCRA COMPARABLE FUEL EXCLUSION; PROPOSED RULE

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Schreiber, Yonley & Associates' Comments on EPA's Proposed Rule: Emission Comparable Fuel Expansion: 2007

Overview:

The Cement Kiln Recycling Coalition (CKRC) asked Schreiber, Yonley & Associates (hereinafter SYA) to provide a technical assessment of the "Emission Comparable Fuel Expansion" (hereinafter "ECF") proposed rule (Federal Register, Vol. 72, No. 115, June 15, 2007, p. 33284 - 33334) and related background documents. SYA also was asked to provide on CKRC's behalf responses to EPA numerous solicitations for comment.

EPA has proposed to expand the Comparable Fuels Exclusion via an "Emissions Comparable Fuel Expansion" that the Agency estimates will affect 107,000 tons/year or more of energy-bearing hazardous waste principally by allowing it to be excluded from RCRA regulation if it is burned as fuel in certain types of industrial boilers. Most of the potentially affected "emission-comparable" waste currently is burned for energy recovery in industrial furnaces such as cement kilns. EPA has proposed that these wastes can be burned outside the existing regulatory regime governing hazardous waste combustion and transportation, storage, and handling with no adverse impacts on human health and the environment. SYA has assessed the validity of EPA's technical and environmental claims and assumptions underlying the ECF proposal and has prepared comments addressing the following general areas:

- Technical review of EPA's justification to deregulate only certain boilers while continuing to regulate other industrial devices that can recover energy from the same materials. This section reviews boiler operations and includes an analysis of boiler emissions along with a comparison with the performance of cement kilns.
- Collateral damages of the proposed rule not assessed by EPA. We have analyzed the impact of the ECF proposal on fuel blenders and the quality and quantity of hazardous waste fuel available to cement kilns. We also assess the impact on emissions from cement kilns, documenting the probable effects of the proposed ECF rule that EPA has neither considered nor evaluated in the proposal.
- Evaluation of the chemical components of ECF. We have analyzed and provided comments on the legitimacy of the ECF exclusion for these constituents in the context of EPA's obligation to protect human health and the environment.
- Technical comments on the regulatory approach for the ECF exclusion.
- Evaluation of the risk assessment performed for the ECF exclusion. We provided comments on the limitations of the risk assessment approach used for the proposed ECF exclusion and the corresponding failure to provide an adequate assurance of protectiveness. We include specific comments about the estimates of boilers' dioxin/furan emissions used in the risk assessment.
- Technical evaluation of transportation and storage of ECF.
- Other regulated facilities and the burning of ECF. We examine the validity of EPA's decision to preclude other regulated combustion facilities from burning ECF on a par with boilers.

I. Technical Review of EPA's Justification to Deregulate Only Certain Boilers

In order to provide insight into the effects of transferring ECF wastes from one type of combustor to another without environmental benefit, SYA believes it is pertinent to review the technical differences between kilns and boilers. Our analysis shows that the likely outcome of this proposed rule will be an increase in environmental degradation due to loss of regulatory oversight over a program that EPA has regarded as a high priority for stringent regulation for the last two decades. It will show that EPA has failed to account for the current boiler emissions and how the operation of boilers, absent permitting, testing, or related site-specific technical review, is not an acceptable management strategy for these "greater hazard" ECF compounds. (In the proposed rule EPA has considered ECF to pose a greater hazard than fossil fuel with respect to storage and controlling boiler operations.[1])

The claims made throughout the preamble of the ECF proposal regarding the expected low emissions of certain constituents from certain types of boilers are based on a partial analysis of data that is very unlike EPA's usual thorough investigation of waste combustion emissions. EPA only evaluated emissions from boilers of a specific type and eliminated from consideration those that were burning other fuels (which could increase or decrease emissions).

Our analytic approach frequently involves a comparison between boilers and cement kilns performing identical functions. To ensure a thorough understanding of the effect of the proposed rule on cement kilns and on the environment, we believe it is important to review the technical ability of cement kilns to use waste-derived fuels in an environmentally responsible manner, which requires an understanding of the cement process.

a. A cement kiln system is an industrial combustion device that has the proven ability to productively and safely use hazardous waste fuels.

EPA is very familiar with the cement manufacturing process and its ability to produce an important product for society while efficiently conserving resources through energy recovery from waste-derived materials. For more than 20 years, a segment of the U.S. cement industry has developed the technical capability and acquired the necessary RCRA and air permits to replace a significant amount of their fossil fuels (predominantly coal) with hazardous waste-derived fuel. This practice began in the cement industry prior to this recycling activity being regulated under RCRA. As RCRA regulations were increased to include extensive permitting, testing, risk assessment, monitoring and recordkeeping, these facilities made the necessary investments in equipment and manpower to develop compliance and permitting strategies that met the detailed requirements under RCRA to operate in a manner protective of human health and the environment.

[1] "...CO limit that applies to industrial boilers burning fossil fuels and nonhazardous waste fuels is appropriate given the greater potential for ECF emissions to pose a hazard to human health and the environment (i.e., it is reasonable and appropriate to tailor the management controls that apply to the most analogous product, fuel oil, to address the greater hazards posed by potentially high concentrations of hazardous organic compounds in ECF)." 72FR33295 (emphasis added).

The cement kiln is the point in the manufacturing process where the pyro-processing step occurs, which involves the efficient combustion of large quantities of fuel to drive the high-temperature process. The kiln system is a very large industrial device that involves a rotary kiln and, in more modern units, an elaborate heat exchanger called a preheater/precalciner. The kiln system is operated at extremely high temperatures (flame temperatures exceeding 3,500°F) that are necessary to initiate the process reactions and that are known to destroy essentially all organic constituents. The raw materials are processed in a countercurrent flow to the hot gases, with material temperatures reaching 2,700°F, the temperature at which the chemical and physical reactions occur that result in the creation of Portland cement clinker.

The kiln system not only operates at extremely high temperatures, it also is very thermally stable due to its large size and the large quantity of in-process materials in the kiln. As an example, it takes about 24 hours for the system to cool sufficiently for maintenance to be performed after the flame is extinguished. The high temperatures inside the kiln are maintained long after a fuel cutoff, allowing the kiln's organic compound destruction capabilities to continue even if the flame is turned off.

Through its decades of experience with the use of waste as fuel in the manufacturing process, the cement industry has performed extensive testing in accordance with EPA regulatory requirements, developed extensive databases, and performed extensive risk assessment studies to demonstrate the kiln system's effectiveness in safely utilizing and destroying wastes. This has been demonstrated on an overall emissions basis, which included all emissions from manufacturing combined with the use of fossil fuel and hazardous waste fuel (a subset of which is what EPA now proposes to exclude from RCRA as ECF).

EPA has recognized that the cement industry has repeatedly shown consistent results documenting kilns' ability to achieve an extremely high DRE for organic constituents. The 1997 preamble to the HWC MACT rule NODA states:

> *"the Agency believes that cement kilns that fire hazardous waste into the clinker end of the kiln will virtually always achieve 99.99% DRE because, to make marketable product, clinker temperatures must be approximately 2700°F, and combustion gas temperatures are typically several hundred degrees hotter than the solids temperature. These temperatures are theoretically high enough to ensure destruction of organic compounds in the waste."*[2]

Not only has the industry proved its ability to maintain DRE levels far above the 99.99% standard, but the results of all of the site-specific risk assessments performed by the HWC cement industry have shown that the non-dioxin organic constituents of kiln emissions are not "risk drivers." Further, the source of organic constituent emissions from a cement kiln is principally from naturally-occurring organics in the raw materials. Therefore, if the organic emissions from an HWC cement kiln were compared to the

[2] 62 FR 24240, footnote 65.

baseline burning only fossil fuel (per EPA's approach in ECF proposed rule), the emissions would not be increased due to the use of a waste-derived fuel. (EPA has recognized that the source of these emissions is not typically from the fuel, but rather from the raw materials.)[3]

It also has been documented that cement kilns can actually reduce overall emissions through the use of waste-derived fuel. The use of alternative fuels is one of the industry's key sustainability measures, which reduces emissions of CO_2 and also reduces priority pollutants including NO_x and SO_x.[4] And the constituents that EPA states help to control dioxin/furan emissions (e.g., sulfur in coal) are also prevalent in the cement kiln system.[5] While in the ECF proposal EPA is claiming that emissions from boilers burning ECF will be comparable to burning fuel oil, the Agency has data (e.g., the HWC MACT database[6]) proving the cement kiln system's effectiveness at managing hazardous wastes, of which ECF is a subset.

As stated, a cement kiln's overall emissions can decrease when burning hazardous waste. EPA has documented that waste fuel burning does not impact emissions of specific pollutants. In the preamble to the 1999 HWC MACT rule and associated Technical Background Document, EPA stated:

- *"The standards for both classes of kilns are floor standards and are identical because hazardous waste burning is not likely to affect emissions of either dioxin/furan or particulate matter."* (1999 rule, FR52872)
- *"(W)e considered both hazardous waste burning cement kiln and nonhazardous waste burning cement kiln data together because both data sets are adequately representative of general dioxin/furan behavior and control in either type of kiln. This similarity is based on our engineering judgment that hazardous waste burning does not have an impact on dioxin/furan formation, dioxin/furan is formed postcombustion."* (1999 rule, FR52886)
- *"These data indicate that there is no clear or strong influence of the fuel type or chlorine content on chlorinated PIC emissions levels. The use of chlorinated hazardous waste appears to have varying effects on chlorinated PIC emissions compared with coal only firing, depending on the specific PIC and facility. There is no consistent, noticeable effect. Hazardous waste PIC emissions are higher than baseline in some cases, lower in some cases, and comparable in other cases."* (Final Technical Support Document for HWC MACT Standards Volume III: Selection of MACT Standards and Technologies, July 1999, p. 12-6.)

Despite these findings, EPA has continued to require stringent regulatory controls, testing, and risk assessments for HWC cement kilns, addressing emissions from both the

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[3] 61 FR 17397.
[4] Robert J. Schreiber, Jr., P.E., Scott J. Kellerman, PhD., Carol A. Schreiber, "Comparison of Criteria Pollutants for Cement kilns Burning Coal and Hazardous Waste Fuels", Air & Waste Management Association Waste Combustion in Boilers and Industrial Furnaces, March 26-27, 1996.
[5] 72 FR 33298.
[6] See http://www.epa.gov/epaoswer/hazwaste/combust/finalmact/source.htm

manufacturing process and waste combustion. Since both boilers and cement kilns are capable of burning the same ECF wastes with the same claims of "protectiveness," EPA's rationale for allowing boilers to burn unregulated ECF waste while still fully regulating cement kilns that would recover energy from the same materials is not valid.

As a further example, although EPA has documented that dioxin/furan emissions in cement kilns are not due to hazardous waste burning, and most kilns have demonstrated emissions below what EPA terms "de minimis" in this ECF proposed rule, the cement industry (both HWC and non-HWC) is being required to test for dioxin/furan emissions every 2.5 years to continue to demonstrate low emissions. This is quite a contrast from EPA assuming (without any proof) that boiler emissions of dioxin/furan will be low.

When cement kilns replace coal with hazardous waste, emissions of metals have been documented to be higher due to metals in the waste. However, in contrast to the oil-fired and gas-fired boilers at issue in the ECF proposal, which typically do not have air pollution control systems, the HWC cement industry has demonstrated the effectiveness of the cement kiln system for removing or stabilizing the metals in the system. The metals emissions have been quantified and evaluated through risk assessments at each facility to assure protectiveness of human health and the environment.

b. Analysis of EPA's claims regarding boiler operations and emissions

This subsection and the next several subsections present SYA's assessment of the inconsistencies and shortcomings in EPA's approach to evaluating boiler emissions that are of concern with respect to the proposal to exempt certain boiler facilities from typical RCRA regulatory controls.

EPA's approach considers the effect of burning ECF only in comparison to combustion of fuel oil despite the fact that information in the background documents for the ECF proposal confirms that most industrial boilers actually burn natural gas. According to a report generated by Energy and Environmental Analysis, Inc. in May 2005,[7] approximately 80% of industrial boilers burn natural gas as the primary fuel, and approximately 51% of US industrial boiler capacity (measured as MMBtu/hr) uses natural gas as the primary fuel. The remainder of units and capacity are supplied with coal, oils, wood, or by-product fuels. A breakdown of the types of fuel used to fire boilers is provided in Table 1:

[7] Characterization of the U.S. Industrial Commercial Boiler Population, May 2005, Energy and Environmental Analysis, Inc., p. 2-5.

Table 1 - Fuels Burned in Industrial Boilers

Fuel Type	% of Units	% of Capacity
Natural Gas	80	51
Fuel Oils	11	8
Coal	3	14
Wood	2	6
By-Product/Other	4	21

EPA has noted in the HWC MACT rulemaking that natural gas is typically the non-waste fuel fired in those devices. "Most liquid fuel boilers that burn hazardous waste co-fire the hazardous waste fuel with natural gas.[8]" The evaluation of the effects of the proposed ECF rule would be quite different if EPA had correctly compared the emissions from ECF combustion to those from the fuels actually used by industrial boilers.

Further, EPA's background documents note that fuel oil is rarely used for industrial boilers. The document titled, "*Characterization of the U.S. Industrial Commercial Boiler Population*," May 2005, prepared by Energy and Environmental Analysis, Inc., states the following on p. ES-4:

> "*The biggest consumers of boiler fuel are the paper industry (2,200 TBtu/year) and chemicals industry (1,800 TBtu/year). The chemicals industry consumes more than one-third (775 TBtu/year) of the natural gas used in industrial boilers, and the paper industry consumes 43% (1,406 TBtu/year) of the by-product fuel used in industrial boilers. Coal, coke, and breeze are important fuels for the paper, chemicals, and primary metals industries. The other energy inputs, residual oil, distillate oil, and liquefied petroleum gas (LPG), represent less than 5% of industrial boiler inputs.*" (emphasis added)

In the Agency's cost-benefit analysis[9] (Appendix C, Exhibit C-1), EPA also estimates that the ECF that is burned in industrial boilers off-site will replace a fuel mix of 71.6% natural gas, 9.8% distillate oil, 2.0% residual oil, and 16.7% coal. EPA estimates (without supporting data) in its cost-benefit analysis (footnote a in Appendix C, Exhibit C-1) that ECF that is burned in industrial boilers on-site will, in effect, back out equal amounts of natural gas, #2 distillate oil, and residual oil. Thus, the fuel 'split' for on-site boilers contradicts information that is available for off-site waste boilers, which burn almost exclusively natural gas. Therefore, in calculations that follow, we have disregarded the breakdown of on-site boiler fuel use and assumed that boilers will use natural gas for 71.6% of their fuel requirements.

If boilers convert from natural gas to ECF, there is potential for increased emissions of criteria pollutants, particularly SO_2. Estimates of the potential impact using our estimate of the maximum loss of ECF from cement kilns of 146,000 tons per year (see Section II.b. of these comments) indicate that SO_2 emissions could increase at boilers burning ECF (assumed to be comparable to No. 2 fuel oil) by over 110 tons per year (see Table 2).[10] Note that two conservative assumptions have been made. First, 146,000 tons per year of ECF will likely be burned at boilers per our estimate for loss of ECF at cement kilns. Secondly, as noted above, we assume that 71.6% of the fuel currently

[8] Technical Support Document for HWC MACT Standards, Volume III: Selection of MACT Standards, September 2005, p 25-4.

[9] ASSESSMENT OF THE POTENTIAL COSTS, BENEFITS, AND OTHER IMPACTS OF THE EXPANSION OF THE RCRA COMPARABLE FUEL EXCLUSION-PROPOSED RULE, Economics, Methods, and Risk Analysis Division Office of Solid Waste, EPA, June 2007.

[10] However, nitrogen oxide and carbon monoxide emissions could potentially decrease by 39 and 95 tons per year, respectively.

being used in the boilers that will burn ECF is natural gas. The above changes in emissions are only for the amount of natural gas that will be replaced in boilers by ECF. Because its evaluation included only a comparison between ECF and fuel oil, EPA has not accounted for the environmental effects of the net increase in SO_2 emissions that would result from displacing natural gas, which most boilers currently burn, with ECF.

In addition and perhaps more importantly, HAP emissions will likely increase from boilers that burn ECF. We have used the same basic assumptions as above and, as can be seen in Table 3, for every HAP that is common to both fuel oil and natural gas, there will be a net increase in its emissions, with a total HAP emissions increase of over 4,000 lbs per year. (Note that AP-42 factors that are common to both fuels have been used to prepare Table 3.)

Table 2 - Comparison of Emissions of Criteria Pollutants

Boiler Inventory[A]

Industrial Boilers[B]	# of Units	% of Units	Capacity[C] (MMBtu/hr)	% of Capacity
>10 and <100 MMBtu/hr	15,950	81.7%	520,938	35.6%
>100 MMBtu/hr	3,570	18.3%	943,536	64.4%
	19,520		1,464,474	

Notes:

[A] Characterization of the U.S. Industrial Commercial Boiler Population, Energy and Environmental Analysis, Inc., May 2005

[B] See footnote A - Table ES-1, page ES-2

[C] Capacity as measured in MMBtu/hr

[D] See footnote A - pages 2-5 - 2-7

Emission Factors

Fuel Type/Emission Factors (E.F.)	SO_2	NOx	CO	$PM_{2.5}$
No. 2 Fuel Oil[A]				
E.F. 10-100 MMBtu/hr Units, AP42 (lbs/10^3 gal)	7.1	20	5	0.25
E.F. >100 MMBtu/hr Units, AP42 (lbs/10^3 gal)	7.85	24	5	0.25
E.F. avg. (lbs/10^3 gal)[C,D]	8	23	5	0.25
E.F. avg. (lbs/MMBtu)	0.05	0.16	0.04	0.0018
Natural Gas				
E.F. 10-100 MMBtu/hr Units, AP42 (lbs/10^6 scf)	0.6	100	84	1.9
E.F. >100 MMBtu/hr Units, AP42 (lbs/10^6 scf)[B]	0.6	232.3	84	1.9
E.F. avg. (lbs/10^6 scf)[D,E]	0.6	185	84	1.9
E.F. avg. (lbs/MMBtu)	0.0006	0.18	0.082	0.0019
Comparison				
E.F. Difference, Fuel Oil - Natural Gas (lbs/MMBtu)	0.05	-0.019	-0.05	-0.0001
E.F. Ratio (Fuel Oil/Natural Gas)	93	0.89	0.44	1.0

Notes:

[A] Percent sulfur content of fuel oil assumed to be: 0.05

[B] Percent of units assumed to be pre-NSPS 47% of units > 10 MMBtu/hr are 40 years or older

[C] Heating value, #2 fuel oil (Btu/10^3 gal) 139

[D] Avg. based on boiler inventory capacity

[E] Heating value of natural gas, AP42 (Btu/scf) 1,020

Emissions

146,000 tons/yr potentially excluded under the ECF rule (assuming max. cement kiln loss)
0.0195 MMBtu/lb (heating value #2 fuel oil, Draft Technical Support Document, May 2007)
5,694,000 MMBtu/yr potentially excluded under the ECF rule
71.6% of capacity currently burn natural gas[B]
4,076,904 MMBtu/yr capacity in which ECF replaces natural gas[B]
110 tons/yr SO_2 increase[C]
-39 tons/yr NOx increase
-95 tons/yr CO increase
0 tons/yr $PM_{2.5}$ increase

Notes:

[A] 72 FR 33296

[B] Agency's cost-benefit analysis (Appendix C, Exhibit C-1)

[C] Assumes that ECF has same characteristics (i.e., sulfur content) as primary fuel

Table 3 - Boiler HAP Emissions

	Emissions if Combusting				
	Fuel Oil		**Natural Gas**		**Net Increase**
	Lb/MMBtu	**lbs/year***	**Lb/MMBtu**	**lbs/year***	**lbs/year***
Acenaphthene	3.83E-07	2.26	< 1.76E-09	< 0.01	2.25
Acenaphthylene	4.59E-09	0.03	< 1.76E-09	< 0.01	0.02
Anthracene	2.21E-08	0.13	< 2.35E-09	< 0.01	0.12
Benz(a)anthracene	7.27E-08	0.43	< 1.76E-09	< 0.01	0.42
Benzene	3.88E-06	22.92	2.06E-06	8.71	14.21
Benzo(b,k)fluoranthene	2.68E-08	0.16	< 1.76E-09	< 0.01	0.15
Benzo(g,h,i)perylene	4.10E-08	0.24	< 1.18E-09	< 0.00	0.24
Chrysene	4.32E-08	0.25	< 1.76E-09	< 0.01	0.25
Dibenzo(a,h) anthracene	3.03E-08	0.18	< 1.18E-09	< 0.00	0.17
Fluoranthene	8.78E-08	0.52	2.94E-09	0.01	0.51
Fluorene	8.10E-08	0.48	2.75E-09	0.01	0.47
Formaldehyde	5.98E-04	3533.65	7.35E-05	310.91	3222.73
Naphthalene	2.05E-05	121.00	9.80E-08	0.41	120.59
Pyrene	7.71E-08	0.46	4.90E-09	0.02	0.43
Toluene	1.12E-04	663.90	3.33E-06	14.09	649.80
Total		4,346.6		334.23	4,012.4

*** Based upon the following assumptions:**

Heating value of fuel oil, AP42 (MMBtu/10^3 g	140
Avg. based on boiler inventory capacity	
Heating value of natural gas, AP42 (Btu/scf)	1,020

Emissions

146,000	tons/yr potentially excluded under the ECF rule[A]
0.0202	MMBtu/lb (heating value #2 fuel oil, AP42)
5,905,637	MMBtu/yr potentially excluded under the ECF rule
71.6%	of capacity currently burn natural gas[B]
4,228,436	MMBtu/yr capacity in which ECF replaces natural gas[B]

Notes:

[A] Maximum estimated loss at cement kilns; see section II.b. of these comments

[B] Agency's cost-benefit analysis (Appendix C, Exhibit C-1)

EPA's economic and environmental analysis is fatally flawed because it does not account for the actual change in emissions from the devices that will be using ECF. The Assessment of the Potential Costs, Benefits, and Other Impacts of the Expansion of the RCRA Comparable Fuel Exclusion-Proposed Rule, June 2007, clearly notes that the cost/benefit analysis is a comparison to "conventional fossil fuels":

> *"Because emissions associated with the combustion of excluded waste are expected to be comparable to those associated with conventional fossil fuels, we assume that the proposed rule will lead to no changes in human health and environmental outcomes and that the human health and ecological impacts of the rule are zero."*[11]

However, as EPA's background information shows, the emissions from ECF combustion are not comparable to the fuels that these boilers actually use most abundantly -- natural gas. Thus, the human health and environmental impacts from ECF emissions are not as EPA describes them in the proposed rule. EPA could similarly make comparable emissions comparisons for other, "dirtier" fuels -- coal, wood, etc. If ECF emissions were comparable to those dirtier fossil fuels, would that also mean there would be no changes in emissions and no impact on human health and the environment? That clearly would not be the case, and this rulemaking has a fundamental flaw in its assumptions and conclusions regarding the changes to emissions and the resulting impacts on human health and the environment.

c. Lack of pollution control equipment on many boilers

In the EPA background documents, there is a discussion of the relative ages of the boilers most likely to burn ECF. According to the report,[12] 47% of boilers larger than 10 MMBtu/hr and that would most likely use ECF are 40 years old or older. Boilers of that vintage predate all New Source Performance Standards established for the control of primary pollutants; and therefore, these older industrial and commercial boilers, if they have not been modified, can operate without emission control equipment. Parameters affecting combustion are not controlled effectively (most are operated using either manual operation or with no controls). We believe that combustion efficiency and reliability in older boilers are lower than that of recently installed boilers. The addition of control technology would have to be considered for a boiler to convert to using comparable fuel since older boilers typically do not effectively control of air-to-fuel ratio, flame temperature, etc. Without permitting and oversight, maintenance failures may result in increases in emissions that EPA has not accounted for. Moreover, combustion temperatures in boilers for ECF are relatively low. Boiler combustion temperatures range from 1,200 to 1,800°F, compared to cement kiln burning zone temperatures of 1,800 to 3,000°F. Diesel fuel and natural gas are uniform fuels, well suited for most boilers.

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[11] ASSESSMENT OF THE POTENTIAL COSTS, BENEFITS, AND OTHER IMPACTS OF THE EXPANSION OF THE RCRA COMPARABLE FUEL EXCLUSION-PROPOSED RULE, Economics, Methods, and Risk Analysis Division, Office of Solid Waste U. S. Environmental Protection Agency, June 2007.

[12] Characterization of the U.S. Industrial Commercial Boiler Population, May 2005, Energy and Environmental Analysis, Inc., p. ES-5.

However, mixed waste fuels such as ECF are not uniform and may vary during a 24-hour period, thus necessitating higher burning temperatures for complete combustion.

The lack of pollution control equipment is true for nearly all boilers, except those that burn coal. Without an APCD, soot-blowing activities (see discussion below) may result in spikes of particulate emissions. EPA has not accounted for changes in PM emissions due to the change from natural gas to a liquid fuel that will have some ash. Despite the illusion EPA attempts to create that ECF is "clean," the fact is that burning of ECF/comparable fuels in units lacking particulate matter control devices may result in uncontrolled emissions of metal HAPs. The proposed concentration limits of metals in ECF/comparable fuel are not insignificant. For example, the following are the proposed ECF concentration limits (at 10,000 Btu/lb) for metals that have higher allowable concentrations.

Antimony	12 ppm	Barium	23 ppm
Beryllium	1.2 ppm	Chromium	2.3 ppm
Lead	31 ppm	Nickel	58 ppm
Thallium	23 ppm		

Based upon the maximum allowable metals content in ECF, Table 4 presents potential emissions of those metals based on burning an amount of fuel equal to the heating value of 146,000 tons of #2 fuel oil (based on EPA's assumption that ECF is the same as #2 fuel oil) in boilers and cement kilns. This table also includes a comparison of the metal emissions from boilers burning only fuel oil and natural gas using EPA emission factors. Note that for cement kilns, the estimate is based upon system removal efficiencies (SREs) derived from averaging the SREs of the top 5 HWC MACT sources (aka, the MACT "pool").[13] Note that HWC MACT rulemaking used a volatility ranking approach (low volatile, LVM and semi-volatile metals, SVM) that groups certain metals together. Each of the above metals was assigned an SRE based upon its volatility, either SVM or LVM. Note the quantity assumed for ECF is 146,000 tons per year, the maximum estimated ECF determined to be lost from cement kilns and diverted to boilers. See section II.b. for derivation of that value.

Table 4 clearly shows that boilers with no metals controls burning ECF at the maximum allowable metals concentrations will have emissions of metal HAPs much higher than if those same boilers burned fuel oil or natural gas. More significantly, for all metals examined, burning ECF in HWC cement kilns (where they currently are burned) would result in emissions that are lower than those of boilers by up to three orders of magnitude! Boilers that use ECF will have much higher metal emissions than would be the case for well-controlled, regulated HWC cement kilns.

[13] Technical Support Document for HWC MACT Standards, Volume III: Selection of MACT Standards, September 2005, Appendix C.

Table 4 -Metal Emissions Comparison

	ECF		Fuel Oil		Natural Gas		Cement Kilns w/HWDF		
Metal	Max. Allowable Spec, ppm	**Boiler Emissions, TPY[a]**	Emission Factors,[b] Lb/MMBtu	**Boiler Emissions, TPY[c]**	Emission Factors,[d] Lb/MMBtu	**Boiler Emissions, TPY[e]**	SRE[f]	Max. Allowable Spec, ppm	**Kiln Emissions, TPY[g]**
Antimony	12	**1.3**	No data	**No data**	No data	**No data**	99.837%	12	**0.0028**
Barium	23	**2.5**	No data	**No data**	4.31E-06	**0.0064**	99.837%	23	**0.0055**
Beryllium	1.2	**0.1**	2.99E-06	**0.0088**	1.18E-08	**0.00002**	99.992%	1.2	**0.00001**
Chromium	2.3	**0.2**	No data	**No data**	1.37E-06	**0.0020**	99.992%	2.3	**0.00003**
Lead	31	**3.3**	8.98E-06	**0.0265**	No data	**No data**	99.837%	31	**0.0074**
Nickel	58	**6.2**	2.99E-06	**0.0088**	2.06E-06	**0.0031**	99.992%	58	**0.00065**
Thallium	23	**2.5**	No data	**No data**	No data	**No data**	99.837%	23	**0.0055**
Total		**16.1**							**0.022**

Heating value of fuel oil, AP42 (MMBtu/10^3 gal) 140

Avg. based on boiler inventory capacity

Heating value of natural gas, AP42 (Btu/scf) 1,020

Notes:

[a] 146,000 tons/yr potentially excluded under the ECF rule (assuming max. cement kiln loss), 0% SRE

[b] Compilation of Air Pollutant Emission Factors, Volume I: Stationary Sources, Fifth Edition, Office of Air Planning and Standards, Office of Air Quality Planning and Standards, US EPA, Research Triangle Park, 1995 (AirChief CD-ROM, 1997, Version 5.0) - Values for Distillate Oil

[c] 146,000 tons/yr potentially excluded under the ECF rule (assuming max. cement kiln loss)
0.0202 MMBtu/lb (heating value #2 fuel oil, AP42)
5,905,637 MMBtu/yr potentially excluded under the ECF rule

[d] AP-42

[e] 2,981,631 MMBtu/yr potentially excluded under the ECF rule

[f] Average SRE for top 5 MACT sources for each volatility class as follows:
99.8374% SVM
99.9924% LVM
Source: EPA HWC MACT Database

[g] 146,000 tons/yr potentially excluded under the ECF rule (assuming max. cement kiln loss), with assumed SRE

In a boiler without an APCD there is essentially no system removal efficiency, so the metals that are a part of the ECF would be emitted. EPA does not discuss this fact, nor that some of these metals may be contained in ash or soot that builds up in the boiler (see discussion of boiler residues within these comments (see section I.i.). EPA also does not account for the associated risks from the emissions of these uncontrolled metal emissions. Replacing natural gas with ECF (which would occur to a far greater extent than replacing fuel oil), will result in a significant incremental increase in emissions from metals from ECF combustion in boilers, which EPA has failed to analyze.

d. CO correlation to DRE, PICs, and D/F and as it applies to ECF and boilers

EPA has ignored the lack of correlation of CO emissions from boilers and DRE. In the EPA HWC MACT database, there is data showing that hazardous waste boilers have failed DRE (two watertube boilers failed for benzene DRE and one run failed for toluene). The boilers that failed DRE used two of the ECF compounds as POHCs (see Table 5). More importantly, both CO and THC emissions were low during both of these DRE failures. Thus, there is clear data showing that, in a boiler, low CO does not always correlate to DRE. EPA has based its conclusion ("*...a DRE failure must simply be indicated by high CO*"[14]) on one study from 20 years ago,[15] without regard to all of the information (e.g., compliance test data under the BIF regulations, trial burn data, all of the data in the HWC MACT rulemaking databases) available in its database for the hazardous waste combustion industry.

In addition to EPA's proposed reliance solely on CO limits to ensure 99.99% DRE, the Agency states in the technical background document that the requirement to meet the 100 ppmv CO limit "*would serve to establish good combustion conditions and minimize the formation of chlorinated aromatic PCDD/F precursors as PICs*;" and that "*continuous CO monitoring would warn of flame quenching or other process upsets that could cause soot deposition in downstream boiler tubes and contribute to increased PCDD/F emissions.*"[16] This implies that the CO correlation with PIC emissions is perfect (even though it has never been a stand-alone combustion monitoring parameter for other HW combustors). It also assumes that CO is the perfect control parameter to eliminate any conditions that could decrease DRE. The ECF proposal makes a leap of faith that limiting CO emissions is an effective control for all PICs, dioxin/furan, and other organic emissions, which is extreme, especially when compared to the level of past scrutiny EPA has applied to other hazardous waste combustors, regardless how much they have been studied.

[14] USEPA, "Draft Technical Support Document for the Expansion of the Comparable Fuels Exclusion," May 2007, page 35.
[15] Hall, D.L., Dellinger, B., Graham, J.L., and Rubey, W.A. "Thermal Decomposition Properties of a Twelve Component Organic Mixture." Hazardous Waste & Hazardous Materials, Volume 3, November 4, 1986, pg 441-449. Lieber, Inc. Publishers.
[16] USEPA, "Draft Technical Support Document for the Expansion of the Comparable Fuels Exclusion," May 2007, p. 52.

Table 5 - DRE Failures

Hazardous Waste Combustor Boilers - DRE Failures

Boiler and Test Description

Phase II ID No.	735
EPA ID No.	IND000807107
Facility Name	Reilly Industries, Inc.
City	Indianapolis
State	IN
Unit ID Name/No.	Boiler 70K
Combustor	Liquid-fired boiler
Combustor Characteristics	Watertube boiler, manufactured by Murray Iron Works Company, Model No. MCF4-64; thermal input capacity of 91.8 MMBtu/hr; steam production rate of 70000 lb/hr @ 300 psig
Hazardous Wastes	Liquid-fired boiler
Haz Waste Description	Pyridine and pyrindine-derived organic chemical production waste
Supplemental Fuel	Natural gas
735C5	
Report Name/Date	Trial Burn Report for Boiler 70K, February 3, 2000
Testing Dates	November 3, 1995
Cond Description	Trial burn; DRE test
Content	DRE, CO
735C4	
Report Name/Date	Trial Burn Report for Boiler 70K, February 3, 2000
Testing Dates	October 19-20, 1999
Cond Description	Trial burn; min comb temp and DRE
Content	DRE, CO, PCDD/PCDF, organics

Emission Results

735C5		R1	R2	R3	Cond Avg
CO (MHRA)	ppmv	0.264	0	0.001	0.09
POHC DRE	**Benzene**				
Feedrate	g/hr	3943	3549	3905	3799
Emissions Rate	lb/hr				
DRE	%	***99.147***	***99.337***	***99.465***	***99.32***
POHC DRE	**Toluene**				
Feedrate	g/hr	29033	27327	28758	28373
Emissions Rate	lb/hr				
DRE	%	***99.987***	99.994	99.995	99.992

735C4		R1	R2	R3	Cond Avg
CO (MHRA)	ppmv	0.0006	0.0435	0	0.01
HC (RA)	ppmv	0.1	0.3	0.6	0.33
POHC DRE	**Benzene**				
POHC Feedrate	g/hr	3189	3476	3254	3306
Emissions Rate					
DRE	%	***99.959***	***99.962***	***99.997***	***99.973***

Phase II ID No.	737
EPA ID No.	IND000807107
Facility Name	Reilly Industries, Inc.
City	Indianapolis
State	IN
Unit ID Name/No.	Boiler 30K
Other Sister Facilities	Boiler 28K(Unit 738)
Combustor Type	Liquid-fired boiler
Combustor Characteristics	Watertube boiler. Babcock and Wilcox Company; a type FM; max thermal input of 39.3 MMBtu/hr; max operating pressure of 250 psig, a nameplate steam production rate of 30000 lbs/hr.
Hazardous Wastes	Liquid-fired boiler
Haz Waste Description	Pyridine and pyrindine-derived organic chemical production waste
Supplemental Fuel	Natural gas
737C4	
Report Name/Date	Trial Burn Report for Boiler 30K, February 3, 2000
Testing Dates	November 2-3 and 5, 1999
Cond. Description	Trial burn, min comb temp, min steam prod rate
Content	DRE, PCDD/F

737C4	**Trial Burn**	R1	R2	R3	Cond Avg
CO (MHRA)	ppmv	0.15	0.036	0.012	0.066
CO (RA)	ppmv	0.09	0.008	0.005	0.034
HC (RA)	ppmv	0.1	1.6	1.7	1.133
POHC DRE	**Benzene**				
POHC Feedrate	g/s	0.377	0.532	0.513	0.474
Emission Rate	g/s	5.6E-04	1.5E-03	9.1E-04	0.001
DRE	%	***99.853***	***99.712***	***99.823***	***99.796***
POHC DRE	**Toluene**				
POHC Feedrate	g/s	2.713	3.821	3.687	3.407
Emission Rate	g/s	3.7E-05	1.7E-04	3.2E-05	0.000
DRE	%	99.99865	99.9956	99.99912	99.998

Source:

Hazardous Waste Combustors - Maximum Achievable Control Technology (MACT) Standards, Source Data for Hazardous Waste Combustors, Individual Source Data Sheets; files - 735.xls and 737.xls

http://www.epa.gov/epaoswer/hazwaste/combust/finalmact/source.htm

Further, if CO is the only necessary control for emissions of PICs, why then do other combustors require the use of additional operational controls, such as minimum combustion chamber temperature, maximum waste feed rates, and minimum residence time? As EPA points out, CO cannot indicate the failure mode for lack of fuel ignition.[17] However, a minimum combustion chamber temperature limit would eliminate that possibility. In addition, minimum residence time would assure that waste does not leave the combustion chamber before complete destruction occurs.

As the data in Table 5 shows, CO and THC can be low and yet a DRE failure can occur (note that the failures occurred with ECF compounds). Thus, it would seem prudent that, for ECF compounds, DRE testing should be performed on a periodic basis and appropriate limits should be placed on the relevant parameters (minimum combustion chamber temperature, maximum ECF firing rate, minimum residence time) to assure ongoing "good combustion" is maintained.

To ensure good combustion, in the proposed rule EPA has included the following requirements for boilers burning ECF: CO emissions less than 100 ppm, proper atomization, and firing ECF into primary fuel flame zone. Proper atomization and the placement of the ECF in the primary fuel flame zone would contribute significantly to achieving complete combustion of the ECF. There are, however, other considerations in the design and operation of boilers that affect combustion performance. Without testing to validate that the atomization is "proper" for the particular boiler and that the primary fuel flame zone is where it is supposed to be, there is no demonstration of compliance and no guarantee that combustion conditions are actually "good".

Can a CO limit of 100 ppm or a hydrocarbon limit of 10 ppm ensure DREs of 99.995% and 99.999% at the specified feed MTECs?[18] EPA does not discuss the impact of increasing DRE and the ability of CO to assure compliance with these levels. This also points out EPA's flawed use of CO as the only control for combustion. That is, CO may not indicate whether the 99.99% DRE limit is being achieved.

EPA has also ignored the fact the dioxin/furan emissions are not necessarily related to combustion. In the preamble to the 1999 HWC MACT rule, EPA commented about the potential for post-combustion emissions versus fuel-derived emissions from other hazardous waste combustors:

> "*...hazardous waste burning does not have an impact on dioxin/furan formation, dioxin/furan is formed postcombustion.*"[19]

EPA has certainly not ruled out this same D/F formation mechanism for boilers in its analysis. Thus, we do not understand EPA's logic in the discussion relating to CO correlating to the formation of dioxins/furans. As EPA notes, most boilers do not have an

[17] Ibid, p. 34.

[18] EPA asks for specific comment on *"our views regarding the relationship between DRE and compound feedrate."* 72 FR 33315.

[19] 64 FR 52876.

APCD.[20] Therefore, the vast majority of boilers would not have any control over possible post-combustion formation of dioxins/furans. As the next section will describe in detail, with minimal or even no precursors, dioxins may still be created post-combustion. Boilers are subject to dioxin/furan formation, with or without the presence of boiler residue or soot. Control of CO does not correlate to emissions of dioxin/furans.

e. EPA's comparison of emissions from fuel oil vs. ECF

We would like to point out key technical issues associated with emissions of fuel oil compared to that of ECF. In the ECF proposal, EPA states– "*This proposal would exclude waste fuels that generate emissions, when burned in an industrial boiler, which are comparable to emissions from burning fuel oil.*"[21]

The removal of the specifications for certain hydrocarbons and oxygenates in comparable fuel burned in an industrial boiler is based on EPA's contention that those compounds offer substantial added fuel value and "*that emissions from burning ECF in an industrial boiler operating under good combustion conditions are likely not to differ from emissions from burning fossil fuels under those same conditions [emphasis added].*"[22]

The proposed regulation goes on to define boiler operating conditions that "*ensure that the ECF will be burned under good combustion conditions typical for oil-fired industrial boilers.*"[23] These operating conditions were compiled based upon EPA's mid-1980 tests[24] for boilers burning supplementary fuel.

Based on this limited boiler testing, EPA concluded:

- Boilers co-firing hazardous waste fuels with fossil fuels where the hazardous waste provides less than 50% of the boiler's fuel requirements can achieve 99.99% destruction and removal efficiency (DRE) of POHCs under a wide range of operating conditions (load changes, waste feed rate changes, excess air flow changes).
- For boilers operated at high combustion efficiency with CO emissions less than 100 ppmv, DRE exceeds 99.99%.
- Boilers clearly operating under poor combustion conditions (as EPA defined as high opacity) also still achieve 99.99% DRE.

The underlying assumption (as recommended by the American Chemistry Council) is that wastes containing non-halogenated organics and oxygenates (even if concentrations

[20] The few boilers that have baghouses would need to maintain a temperature below 400°F at the inlet to the baghouse for control of dioxin/furans, and only if not burning coal.
[21] 72 FR 33287.
[22] Ibid.
[23] Ibid.
[24] Hall, D.L., Dellinger, B., Graham, J.L., and Rubey, W.A. "Thermal Decomposition Properties of a Twelve Component Organic Mixture." Hazardous Waste & Hazardous Materials, Volume 3, November 4, 1986, pg 441-449. Lieber, Inc. Publishers.

are high) do not result in emissions greater than burning waste fuel that meets the comparable fuel specification if the boiler operates under good combustion conditions. The boiler would be expected to destroy the organics and oxygenates to the same level (an assumed DRE of 99.99%) at high ECF feed concentrations as at low concentrations.

Consider the following hazardous air pollutants (HAPs) that appear as constituents in the waste streams identified as potential comparable fuels under the expanded exclusion [Memo to Robert Springer and Matt Hale from Robert Elam, ACC (EPA-HQ-RCRA-2005-0017-0003[1]). Table 6 was created based upon only those streams from the ACC list with the highest concentration of the listed HAPs. Since many of the listed streams did not indicate the percent compositions of HAPs, the following results represent only a portion of the ECF universe and do not reflect the entire potential impact.

The HAP and VOC emissions from the combustion of ECF in boilers will be greater than those emitted when fuel oil or natural gas is combusted (see Tables 7 and 8). Emission factors from AP-42 for fuel oil combustion and natural gas for two of the HAPs listed above can be used to calculate emissions of those compounds.

The tables illustrate that, for VOC, hexane, and toluene, combustion of ECF fuel in place of natural gas or fuel oil produces greater emissions of these constituents. For instance, VOC emissions from combusting an ECF volume of 56.2 million pounds would emit 5,620 pounds of VOC compounds at 99.99% DRE. In comparison, VOC emissions from burning an equivalent thermal amount of natural gas would be 3,031 pounds. In addition, several hazardous air pollutant emissions will result from the combustion of ECF streams that are not found in the combustion exhaust of fuel oil or natural gas. From Table 3, MTBE, ethylbenzene, styrene, and methanol are not emitted during natural gas or fuel oil combustion, while they would be expected to be in the combustion exhaust when burning certain of the larger ECF streams. The emissions from ECF combustion clearly are not "comparable" to combustion of either fuel oil or natural gas.

EPA further states that, "*because operating a boiler under good combustion conditions, evidenced by carbon monoxide emissions below 100 ppmv, assures the destruction of organic compounds generally to trace levels, irrespective of the type or concentration of the organic compound in the feed.*" *EPA contradicts this statement by stating that "when ECF with higher concentrations of certain hydrocarbons and oxygenates than fuel oil is burned even under good combustion conditions, emissions of toxic organics may be somewhat higher than those from burning fossil fuel. This is because combustion is generally a percent-reduction process.*"[25]

[25] 72 FR 33292.

Table 6 - HAPS in Potential ECF Waste Streams

Constituent (HAP)	% in Stream (%)	Waste Volume (10^6 lbs)	Constituent Volume in Waste Fuel Feed (10^6 lbs)	ECF Air Emission at 99.99% DRE (lbs)
Hexane	60	1.2	0.72	72
MTBE	14.4	16	2.30	230
Ethylbenzene	22	1.85	0.41	41
	25	1.5	0.38	38
	6	16	0.96	96
Styrene	5	1.85	0.09	9
Methanol	27	56.2	15.2	1,520
Toluene	35	1.2	0.42	42
	50	1.2	0.60	60
VOC	100	56.2	56.2	5,620

Table 7 - Fuel Oil Constituent Emissions

Constituent (HAP)	Emission Factor (lb/10^3 gal)	Fuel Oil Volume (10^3 gal)	Fuel Oil Air Emission (lbs)
Hexane	6.36×10^{-5}	85.7	0.0055
Toluene	6.20×10^{-3}	171	1.06
VOC	0.252	4,014	1,012

*Assuming a waste fuel heating value of 10,000 Btu/lb and fuel oil heating value of 140,000 Btu/gal.

Table 8 - Natural Gas Constituent Emissions

Constituent (HAP)	Emission Factor (lb/MMscf)	Natural Gas Volume (MMscf)	Natural Gas Air Emission (lbs)
Hexane	1.8	11.8	21.2
Toluene	3.40×10^{-3}	23.5	0.08
VOC	5.5	551	3,031

*Assuming a waste fuel heating value of 10,000 Btu/lb and natural gas heating value of 1,020 Btu/scf.

In the preamble to the Boiler and Industrial Furnace Regulations (56FR35, February 21, 1991, p. 7150), EPA states the following when discussing use of a CO limit to control PICs:

> *"Thus, in the waste combustion process, the "destruction" of POHCs is independent of flue gas CO levels. CO flue gas levels cannot be correlated with DREs for POHCs, and may also not correlate well with PIC destruction."*

EPA goes on to say in the BIF rule preamble that the Agency chose to use flue gas CO levels as an indicator of good combustion based on the general relationship that when CO is low, PIC concentrations are usually also low.[26] The statement in the ECF rule that CO levels below 100 ppmv in the flue gas assures destruction of organic compounds to trace levels is at odds with EPA's earlier observations.

We concur with EPA's statement that combustion is generally a percent-reduction process. As a percent-reduction process, constituent emissions from any given fuel will be directly proportional to the constituent feed concentrations. For example, emissions from a fuel with a benzene concentration of 4% will be two times higher than the emissions from the same fuel with a benzene concentration of 2%. To compare emissions of different fuels, the comparison must be made on an equal heating value basis.

We have completed such an analysis by comparing constituent emissions from the combustion of ECF waste streams identified by ACC member companies[27] to the emissions from the combustion of a fuel qualifying for the current comparable fuels exclusion. In addition, for each compound for which the concentration limits are waived under the proposed rule, we have compared potential emissions of the compound (assuming the ECF waste stream is comprised entirely (100%) of the compound) to the emissions of a fuel containing the compound at the maximum concentration allowed under the current comparable fuel standard. The results of this analysis are shown in Table 9 (supporting spreadsheet is provided in Attachment A). The second column of the table shows the factor increase in emissions from potential ECF wastes identified by ACC compared to comparable fuel of equal heating value. The factors range from a low of 2 for toluene to a high of 18,462 for methyl ethyl ketone (MEK). This means that emissions of MEK for a potential ECF stream identified by ACC will be 18,462 times higher than an equivalent comparable fuel at the maximum MEK concentration allowed by the current comparable fuels standard. The third column of the table shows the factor increase assuming the ECF waste stream is comprised solely of the constituent (100%). Under these conditions, the factor increase range from 15 for toluene to 28,858 for propargyl alcohol.

It should be noted that with the exception of benzene and toluene, none of the 26 compounds excluded under the ECF proposed rule are expected to be found in fuel oils,

[26] 56 FR 7150.
[27] Memo to Robert Springer and Matt Hale from Robert Elam, ACC (EPA-HQ-RCRA-2005-0017-003).

nor were they found in the composite fuel samples EPA used to develop the comparable fuels exclusion rule. Some of these constituents (acetophenone, acrolein, isobutyl alcohol, and methyl ethyl ketone) are known to be present in materials potentially qualifying as ECF. It is hard to understand how EPA can claim that emissions of these constituents are comparable to emissions from fuel oil or fuels meeting the current comparable fuels standard when these constituents are not even expected to be present in fuel oil, much less in natural gas which is more widely used in the boilers proposed for exclusion in the ECF rule. Clearly, this table shows that one cannot assume that emissions from ECF waste streams are comparable to fuel oil or to fuels meeting the current comparable fuels specifications.

Several of the ECF constituents with high factor increases are also relatively toxic. For example, acrolein had the highest possible WMPA score for both human and ecological toxicity. As noted above, acrolein is one of the ECF compounds that has been identified as being present in waste streams potentially excluded under the ECF standard. Allyl alcohol also had the highest possible WMPA score for ecological toxicity.

In the preamble to the proposed rule, EPA acknowledges that ECF emissions may not be comparable to emissions from burning fuel oil: "*For example, if we assumed that a DRE of only 99.99% were achieved when feeding ECF with a 90% concentration of a compound of concern at the maximum firing rate (i.e., 25% for benzene and acrolein and 50% for the other compounds), the residual emissions of the compound would far exceed the emissions from burning oil.*"[28] As a result, EPA requests comments on an approach that would identify a target emission level for each of the ECF compounds, estimate a DRE for the compound, and calculate a maximum ECF firing rate as a function of the concentration of the compound in the ECF.

EPA has not evaluated actual emissions of ECF at the range of potential feedrate concentrations allowed by the proposed rule and therefore cannot be assured that ECF emissions will be comparable to fuel oil emissions. As already noted, the comparison that really needs to be made is ECF emissions vs. emissions from burning of natural gas. EPA has neglected to evaluate projected ECF emissions vs. natural gas emissions.

As already noted, EPA outlines an alternative approach to establishing firing rate limits for ECF.[29] A more detailed description of the approach can be found in the docket.[30] For each ECF compound, the method would identify a target emission level, estimate a DRE, and then calculate a maximum ECF firing rate as a function of the concentration of the compound. A concern regarding this alternative approach is as follows:

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[28] 72 FR 33315.

[29] 72 FR 33315.

[30] Potential Approach to Establish Firing Rate Limits on Emission Comparable Fuel, Memo from Bob Holloway, May 21, 2007, EPA-HQ-RCRA-2005-0017; and Background Information and Sample Calculations for Potential Approach to Establish DRE based Firing Rate Restrictions for ECF, Memo from Bob Holloway, May 21, 2007, EPA-HQ-RCRA-2005-0017.

- The DRE versus feedrate MTEC data for hazardous waste burning boilers shows numerous benzene runs where 99.99% DRE was not achieved at MTEC concentrations below 1.00E06 µg/dscm @ 7% O_2. This would suggest that there should be a minimum feedrate limit established for benzene to ensure at least 99.99% DRE. However, this is counterintuitive to the 2% feedrate limitation of benzene feedrate in the rule. Higher benzene levels are associated with increased health risks, which is EPA's basic reason for limiting benzene feed rates. Thus, on one hand, EPA seems to say that higher benzene levels are needed to guarantee 99.99%DRE, but that benzene must be limited due to health-based considerations. We believe this should mean that, with the uncertainty of DRE balanced by the need for safety of the emissions, benzene should be eliminated as an ECF chemical.

Table 9 - ECF Emissions Constituent Analysis

ECF Constituent	Factor Increase in ECF Emissions (ACC Data[1])	Factor Increase in ECF Emissions (Const. Conc. = 100%)
Benzene	9	135
Toluene	2 – 19	15
Acetophenone	56	280
Acrolein	16	20,513
Allyl alcohol	NA	24,249
Bis(2-ethylhexyl)phthalate [Di-2-ethylhexyl phthalate]	NA	275
Butyl benzyl phthalate	NA	286
o-Cresol [2-Methyl phenol]	NA	278
m-Cresol [3-Methyl phenol]	NA	282
p-Cresol [4-Methyl phenol]	NA	277
Di-n-butyl phthalate	NA	313
Diethyl phthalate	NA	382
2,4-Dimethylphenol	NA	272
Dimethyl phthalate	NA	400
Di-n-octyl phthalate	NA	273
Endothall	NA	13,333
Ethyl methacrylate	NA	20,238
2-Ethoxyethanol [Ethylene glycol monoethyl ether]	NA	8,420
Isobutyl alcohol	4 – 3,497	1.629
Isosafrole	NA	304
Methyl ethyl ketone [2-Butanone]	205 – 18,462	19,022
Methyl methacrylate	NA	22,492
1,4-Naphthoquinone	NA	331
Phenol	NA	298
Propargyl alcohol [2-Propyn- 1 –ol]	NA	28,858
Safrole	NA	301

ECF Factor Increase is the ratio of ECF emissions per Btu heat input to Comparable Fuel emissions per Btu heat input.
[1] Factors calculated using data on ECF qualifying waste streams presented by the American Chemistry Council (ACC) [Memo to Robert Springer and Matt Hale from Robert Elam, ACC (EPA-HQ-RCRA-2005-0017-003)]

f. Greater hazard of ECF and the comparison to fuel oil

There are some major inconsistencies in EPA's statements about the comparison of ECF to fuel oil in the proposed rule. As an example, when referencing storage components, EPA makes a clear distinction that there is a greater hazard for ECF. EPA specifically notes that ECF can pose a greater hazard than fuel oil during storage given that ECF can contain higher concentrations of certain hazardous volatile hydrocarbons and oxygenates.[31] On the other hand, EPA works hard to portray ECF as comparable to fuel oil in the context of boiler emissions. However, EPA has also proposed firing rate restrictions despite its claims about the purported comparability of emissions. As demonstrated throughout this document, ECF emissions can potentially be much higher and much different than fuel oil emissions; thus, ECF emissions are not truly comparable to fuel oil emissions (and certainly not to natural gas emissions) and the can pose a greater hazard than fuel oil emissions.

Clearly EPA's hazard ranking and firing rate restrictions on ECF materials is a tacit admission that ECF emissions are not comparable to fuel oil emissions. If, as EPA claims, ECF emissions are comparable irrespective of the type or concentration of the organic compounds in the ECF (hence, risk is comparable), why are firing rate restrictions necessary? And if the ECF emissions for benzene and acrolein (two compounds for which firing rate restrictions are proposed) are not comparable to fuel oil, then how can EPA conclude that the ECF emissions from all of the other ECF constituent compounds are comparable to fuel oil emissions?

EPA appears to address the fact that ECF emissions can potentially be greater than fuel oil emissions by proposing firing rate restrictions on certain compounds with higher hazard potential. EPA categorized the 37 hydrocarbons and oxygenates based on their relative hazard. The proposed rule retains the existing specifications for compounds that pose a high hazard, and restricts the firing rate of compounds -- benzene and acrolein -- that pose a lower but substantial hazard with the intent of ensuring that emissions from burning ECF remain protective. EPA states that, "*ECF firing rate restriction would reduce the feedrate of benzene and acrolein and thus <u>ensure</u> that emissions of these compounds remain at levels comparable to emissions from burning fuel oil in industrial boilers...* ". [emphasis added] [32] The proposed rule restricts the firing rate of ECF that has benzene or acrolein concentrations exceeding 2% by weight as fired, to 25% of the heat input to the boiler (on a heat input or volume input basis, whichever results in the lower volume of ECF). We have several concerns regarding EPA's proposed firing rate restrictions.

EPA's approach of categorizing the compounds based on relative hazard and then proposing restrictions based on that categorization does not go far enough in characterizing the risk to human health and the environment. EPA has not presented any evidence to conclude that allowing unlimited concentrations of Category C compounds in ECF is protective of human health and the environment. The proposed allowance of

[31] 72 FR 33301.
[32] 72 FR 33300.

unlimited concentrations is based on the "low hazard" categorization resulting from the screening-level hazard ranking process and other risk data from the combustion of materials not comparable to ECF. Because the screening-level hazard ranking process does not include dose or other site-specific factors, it does not adequately characterize the risk.

Nor has EPA presented any evidence that the proposed firing rate restrictions for benzene and acrolein are protective of human health and the environment. In fact, EPA's only rationale for selecting a 25% firing rate restriction is that it is in the middle of the range of values that could have been considered. This is clearly arbitrary and does not ensure protection of human health and the environment. A 25% firing rate restriction still allows for considerably higher feedrate concentrations of these compounds than allowed under the existing comparable fuels specification. For example, if we consider 100% benzene ECF being fired with No. 2 fuel oil, with a 25% firing rate restriction based on a heat input basis, the ECF benzene feed and benzene emissions will be at least 3.4 times greater than a feedstream that meets the existing comparable fuels concentration limit for benzene (see Table 10 below). If firing rate restrictions are warranted based on higher emissions of these "higher hazard" compounds, then EPA needs to demonstrate that the firing rate restrictions are not set arbitrarily, but rather are protective of human health and the environment.

Additionally, the proposed firing rate restrictions simply dilute the concentration of the stack emissions. Assuming sufficient boiler capacity, the feedrate restrictions do not reduce the overall emissions of these compounds. If, as EPA suggests, DRE increases with increasing feed concentration,[33] then for a given waste stream, overall emissions of the compounds with firing rate restrictions can potentially be higher than if there were no firing rate restrictions. Thus, EPA's feedrate restrictions are counterintuitive to the argument for demonstrating adequate DRE. Since EPA has other reasons (such as benzene toxicity concerns) for limiting the feedrates of certain ECF compounds and because DRE becomes more suspect at lower feedrates, we suggest that those compounds be eliminated from consideration as part of ECF.

[33] 72 FR 33315.

Table 10 - Comparison of ECF Emissions to CF Emissions

Basis and Assumptions

1.0 MMBtu feed to boiler (Basis)

25% Benzene in ECF based on heating value to boiler

ECF Emissions

Benzene in ECF Feed

0.25 MMBtu (1 MMBtu basis * 0.25)

0.18 MMBtu/lb (heating value of benzene[1])

1.39 lbs (0.25 MMBtu / 0.18 MMBtu/lb)

ECF Benzene Emissions

0.000139 lbs benzene emissions (1.39 lbs benzene * (1 - 0.9999))

Comparable Fuel (CF) Emissions

Benzene Concentration Limit in CF[2]

4,100 ppm @ 10,000 Btu/lb

Benzene in CF Feed

100 lbs CF Feed (1 MMBtu basis / 10,000 Btu/lb * 10^6 Btu/MMBtu)

0.41 lbs benzene in feed (100 lbs CF Feed * 4,100 lbs benzene/10^6 lbs CF)

CF Benzene Emissions

0.000041 lbs benzene emissions (0.41 lbs benzene * (1 - 0.9999))

Factor Increase of ECF Benzene Emissions Compared to CF Benzene Emissions

3.4 Factor increase (0.000139 lbs benzene / 0.000041 lbs benzene)

[1] Draft Technical Support Document for the Expansion of the Comparable Fuels Exclusion, U.S. EPA, May 2007

[2] Table 1 to 40 CFR 261.38

g. The proposed rule defines minimum heating value for ECF and fossil fuels as 8,000 Btu/lb as fired

The 8,000 Btu/lb minimum seems inappropriate given the much higher heating values of the pure listed ECF compounds. The only way that lower heating values of ECF as fired would occur would be if other non-fuel constituents (most likely water) were to be mixed with the ECF waste. EPA has not accounted for how well a boiler will operate while allowing a high amount of non-ECF contamination of the fuel. Theoretically, an ECF stream may contain almost 50% water and still have the 8,000 Btu/lb as fired minimum. If other non-hazardous compounds (other than water) are mixed with the waste, these compounds may contain non-volatile constituents that will result in the formation of residues (ash). EPA also has not addressed the impacts of the generation of residues within the boiler.

Per Table 2-1 of the Draft Technical Support Document for the Expansion of the Comparable Fuels Exclusion, the heating values of the two excluded hydrocarbons, benzene and toluene, are 18,061 and 18,279 Btu/lb respectively. Only a single oxygenate (endothall) has a heating value of 7,500 Btu/lb, with the remaining compounds ranging from 10,428 to 15,498 Btu/lb. Fifteen of the 24 oxygenates have heat values in excess of 13,000 Btu/lb. Therefore, we question the need to allow a fuel value as low as 8,000 Btu/lb. If these streams as generated are not the pure compounds, EPA needs to quantify what other constituents are part of these streams and determine their impact on the boiler's ability to effectively utilize them as a fuel. These other constituents that may be part of the ECF or other fuels may not be hazardous, yet may nonetheless result in additional ash formation. The proposed rule does not account for the impacts of the emissions of ash.

In addition, the combustion efficiency of the boiler may be impacted if the ECF contains non- or low-heat value materials (e.g., water). The proposed rule does not address the effects that lower heat values may have on the combustion efficiency of the boiler. For example, the boiler firing system for ECF may need to be modified to account for lower heating value fuel. If the ECF fuel value can vary from as low as 8,000 Btu to as high as 18,000 Btu/lb, the mass feedrates needed to fire an equivalent heat input would vary considerably. The boiler's firing system may not be optimal over that entire range of input. With only CO as an indicator of emissions and DRE control, the chances of the one failure mode CO cannot control -- total ignition failure – actually occurring will increase. This may occur since effective atomization of the fuel may not be possible over the wide potential range of fuel firing rate.

EPA should not allow ECF to be lowered in quality to 8,000 Btu/lb. We suggest that EPA consider raising the minimum Btu value for ECF to at least14,000 Btu/lb. Since the proposed rule provides no limitation other than the specification for other comparable fuels constituents, the higher Btu value will minimize the possible impact that non-hazardous constituents may have on the combustion efficiency and possible buildup of ash or soot on the tubes of the boiler. In addition, upon reviewing the survey provided by ACC regarding potential streams that would qualify for ECF, the average heat content of the streams (i.e., those streams that do not have high metals or other non-qualifying properties) is nearly 15,000 Btu/lb. Thus, for the reasons noted above, there should be no reason to allow untested and unsubstantiated dilution of ECF wastes.

EPA has made the clear distinction that ECF is to be compared to fuel oil. Fuel oil has a very high heating value. Thus, we do not understand how ECF blended to 8,000 Btu/lb can be compared to fuel oil nor why EPA thinks it appropriate to do so. The 8,000 Btu/lb limit for as-fired fuel proposed by EPA apparently is based upon the lowest quality of fossil fuels available, sub-bituminous coal. EPA has not included a rationale for use of such coal as a benchmark fuel. In fact, EPA has clearly stated that the benchmark for ECF is No. 2 fuel oil. No data has been included that would indicate that any of the boilers that would use ECF now use such a low-quality fuel. EPA does not include within this proposal the impacts of the emissions of low-quality fuels such as sub-bituminous coal burned in water-tube boilers. We are confident that emissions from burning this low-quality coal would not be comparable to emissions from fuel oil or natural gas. As already noted, 71.6% of the off-site boilers burn natural gas; thus, the reasonable decision should be to only allow fuels that are equivalent in Btu value to fuel oil or natural gas to be burned in boilers with ECF.

Finally, EPA also makes a leap of faith by allowing any other fuel to be burned along with ECF. These other fuels, especially coal, are also not like fuel oil and can have varying heating values as well as higher ash content and very different physical characteristics. We note that very few boilers actually use coal.[34] EPA has not quantified how effectively water-tube boilers, when using these other fuels with ECF, will be able to operate with emissions at least equal to the emissions of boilers using fuel oil with ECF. EPA has not justified or substantiated a clear rationale for allowing the use of fuels other than fuel oil (or natural gas) in water-tube boilers when burning ECF.

i. Boiler residues

The proposal does not address sootblowing practices and the hazards associated with the residues. For example, what happens to the quality of the residues when an automatic fuel cutoff (AFCO) occurs? Products of incomplete combustion may render the ash hazardous. Sootblowing is a necessary practice to eliminate the build-up of ash on boiler tubes. The ECF rule, however, declares that all residues within a boiler are non-hazardous since EPA assumes operating conditions will nearly always destroy any hazardous constituents.[35] A boiler that operates with frequent AFCOs (due to operating at greater than 100 ppmv CO), while complying with the ECF rule, may be generating not only emissions of PICs, but also residues on the tubes that could potentially be characterized as hazardous, despite EPA's arbitrary decision not to regulate all residues.

[34] *"Coal, oil and wood are important fuels in some regions and industries but are designated as the primary fuel for only 3 percent, 11 percent and 2 percent of boiler units."* Characterization of the U.S. Industrial Commercial Boiler Population, May 2005, Energy and Environmental Analysis, Inc., p. 2-6.

[35] *"Given that burning ECF under the proposed conditions will destroy toxic organic compounds in the ECF generally to trace levels, we are proposing that burning excluded fuel that was derived from a hazardous waste listed under §§ 261.31–261.33 does not subject boiler residues, including bottom ash and emission control residues, to regulation as derived-from hazardous waste."* 72 FR 33293.

Although ash may be minimal from firing ECF, it may act as a source of increased particulate emissions (especially if natural gas is the fuel that is being replaced). The ash may also act as a catalyst for the formation of dioxin/furans.

Residues in the boiler may also be higher with ECF use because EPA proposes to allow ECF to be blended with other fuels to meet the 8,000 Btu/lb specification. These could be non-hazardous fuels, yet still contain significant amounts of metals or other inorganic compounds that would contribute to ash build-up on the tubes of the boiler. In addition, 50% of the fuel fired to the boiler can be any fossil fuel or tall oil. Since the composition of these fuels is completely unregulated under EPA's proposed RCRA exclusion for these boilers, fossil fuels may contain significant impurities to contribute ash to the boiler. The ECF rule does not address the impact that residues from any fuel may have on the environmental performance of the boiler.

In addition, EPA ignores the consequences of the build-up of ash on the tubes of the boiler. As noted above, this ash may be the source of catalysts for dioxin/furan formation. Note also that precursor compounds do not need to be present to form dioxin/furans. *De novo* synthesis of dioxins/furans may be formed in the post-combustion environment without the necessary presence of structurally related precursor compounds. Such reactions typically are favored by: temperature range 200-400°C, extended residence time, and the presence of carbon, as well as catalysts. The build-up of carbon deposits on boiler tubes may be the source of carbon, as well as other catalysts. Although ECF will have limited levels of chlorine and certain metals, other unregulated metals may be present to catalyze formation of dioxin/furans. One well known dioxin formation catalyst is copper. Other metal compounds, such as iron and aluminum, can also promote the formation of dioxin/furans. Only a very small amount of chlorine is required to produce significant dioxin/furan emissions. The comparable fuel specification allows up to 540 ppm of chlorine (at 10,000 Btu/lb), which is more than sufficient to support the formation of dioxin furan emissions, which are measured in nanograms.

As introduced above, it is also possible that dioxin/furans may be formed in a boiler from post-combustion heterogeneous formation via the post-combustion catalytic conversion of organic precursors that have condensed on solid particulate surfaces. The rate of formation of dioxin/furans by precursor condensation and heterogeneous catalytic conversion is highly temperature-dependent. The formation rates increase above 200°C and reach a maximum in the 300°C to 500°C temperature range. There is some uncertainty about this temperature range, and lower temperatures may result in formation. Nonetheless, these are temperatures that are possible within boilers using ECF whether or not they have air pollution control devices. As with any organic reaction, the three factors that influence reactions are temperature, reaction time, and concentration of reactants. In a simple system, the reaction rate is proportional to time and concentrations and exponentially related to temperature.

In the support documents for the 2005 Hazardous Waste Combustor MACT Final Standards, EPA identified issues with soot formation and emissions of dioxin/furans.

The formation of dioxin/furans can occur even during "efficient combustion" conditions if soot had previously formed. Even though this references a firetube boiler, there is no reason to assume a watertube boiler would not be similarly affected. This document states:

> "*Recent PCDD/PCDF evaluation testing at an EPA pilot-scale hazardous waste liquid burning firetube boiler has reinforced the importance of avoiding poor combustion conditions, in particular minimizing the formation of soot. It was shown that PCDD/PCDF can be readily formed through initial operations at poor combustion sooting conditions (during which low PCDD/PCDF was measured), followed by efficient combustion conditions, under which PCDD/PCDF was measured in the range of 10 to 50 ng TEQ/dscm. It is suggested that PCDD/PCDF formation is a result of the sooty tube deposits (left during inefficient combustion) in combination with excess oxygen operating conditions (during efficient combustion).*"[36]

EPA acknowledges that factors other than poor combustion may contribute substantially to dioxin/furan formation, such as the level and type of soot on boiler tubes or feeding metals that catalyze dioxin/furan formation reactions.[37] Many liquid-fuel boilers have very long residence times in the boiler section, and thus have long residence times in the de novo dioxin/furan temperature range. Therefore, combustion control is not necessarily an adequate indicator of good control for dioxin/furans. EPA has also stated in the 2004 HWC MACT proposed rule:

> "*Other factors that may contribute substantially to dioxin/furan formation, such as the level and type of soot on boiler tubes, or feeding metals that catalyze dioxin/furan formation reactions, differ across boilers and may change over time at a given boiler. Thus, dioxin/furan levels for these sources may be higher than 0.40 ng TEQ/dscm. For example, we recently obtained dioxin/furan emissions data for a liquid fuel-fired boiler equipped with a wet emission control system documenting emissions of 1.4 ng TEQ/dscm.*"[38]

Most boilers that would use ECF do not have particulate matter control, as most use natural gas as the primary fuel. The ECF rule places no limit on temperature at the boiler exhaust to minimize dioxin/furan emissions from these units. In addition, since the ECF rule places no restriction on stack emissions, boiler residues, and residence time of waste within the system, dioxin/furan emissions from boilers using ECF are, in effect, unmeasured and uncontrolled.

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[36] Technical Support Document for HWC MACT Standards, Volume III: Selection of MACT Standards, September 2005.
[37] 69 FR 21284.
[38] 69 FR 21285.

Since ECF will have some metals, any ash that builds up on the tubes of the boilers will have metals contained within it. This proposed rule has stated that boiler residues are not regulated as derived-from hazardous wastes.[39] However, the build-up of metals may render the residues (ash) dangerous with respect to workplace exposure. Routine maintenance and cleaning of boiler tubes may subject workers to unsafe exposure levels of metals. By excluding the residues from regulation, EPA may give the false impression that these residues are not dangerous.

j. Test data does not match future ECF boiler conditions

EPA cites ECF test data that does not reflect the reality of burning ECF in the units that will most likely be used. Sparse data from industrial boilers that burn fuel oil does not adequately address the potential emissions from future boilers using ECF. These boilers will most likely be burning natural gas and ECF. EPA does use select data from hazardous waste boilers in a comparative analysis of dioxin/furan risks for ECF boilers (and only dioxin, not other HAPs). Interestingly, this data is for boilers using liquid hazardous wastes, not fuel oil, and those devices also co-fire natural gas. The test data EPA has used for analysis, therefore, does not reflect the boilers' future operating conditions.

With the paucity of real data for boilers that may be using ECF, we find the proposed unregulated (no permits, no emission testing, little if any direct regulatory oversight) aspects of this proposed rule very troubling. Other hazardous waste boilers and industrial furnaces have collected a plethora of emissions data in support of compliance and permitting activities. The permits for these facilities include significant operating limits to assure compliance with numerous emission and other standards (treatment, storage, handling, etc.). In reality, the wastes and facilities that would be allowed to burn ECF are a subset of the same devices regulated under RCRA (BIF) and the Clean Air Act (HWC MACT). Since the existing data available to EPA regarding emissions of ECF is lacking, we believe it would be prudent for EPA to require a level of regulatory oversight comparable to HWC facilities, or for EPA to perform a much more extensive evaluation of emissions, risk, and storage and handling practices prior to making a decision with respect to ECF.

[39] 72 FR 33327.

II. Collateral Damages Not Assessed By EPA

There are effects of the ECF proposal on cement kilns and fuel blenders that have not been assessed by EPA. The diversion of certain high-quality fuel streams defined by the ECF proposal will significantly adversely affect the operations of fuel blenders and cement kilns. The comments below describe the impacts on blenders and cement kilns separately. Included within this discussion are estimates of the volumes of wastes that will be diverted away from blenders and cement kilns. Also included herein are estimates of the environmental effects that will result from the ECF proposal if it is finalized.

EPA's proposal as written will have a direct negative impact on the current regulated management and treatment of the same waste materials that are currently being burned for energy recovery as part of the cement industry's commitment to sustainability. The ECF proposal will allow the transfer of ECF fuels from the stringently regulated (RCRA and HWC MACT) cement kilns to unregulated or lightly regulated non-RCRA, non-HWC MACT boilers. The transfer of these materials will have a negative impact from multiple perspectives, including requiring cement kilns to replace the ECF wastes with fossil fuel (coal) or hazardous waste (if available). As described below, this does not result in increased fuel efficiency, nor does it improve net emissions. This is strictly a transfer of wastes from one manufacturing process using the materials for energy recovery with extremely high combustion efficiency to another manufacturing process that is less regulated. This proposal to merely transfer these wastes from regulated units to non-regulated units with no additional benefit is very much at odds with 20 years of EPA repeatedly rewriting hazardous waste combustion regulations to create an extremely stringent set of standards and compliance requirements.

a. ECF impacts to fuel blending

The ECF proposed rule will have significant impacts on the blending of hazardous waste fuels. Fuel blenders use the wastes proposed as ECF as a base source of relatively good quality secondary material to blend with lesser quality secondary materials. The following provides background information on the fuel blending process.

i. <u>Fuel blenders are a significant source of hazardous waste fuel for cement kilns.</u>

The fuel blending process is somewhat varied from processor to processor, but, fundamentally, each fuel blender receives a variety of liquid wastes in drums, totes, tank trucks, and/or railcars. These wastes are received from a wide range of sources and include:

- Chemical industries
- Paintings and coatings
- Treatment by-products
- Automotive industry
- Consumer products
- Printers
- Off-spec products
- Refineries
- Aerospace industry
- Small quantity generators

Once the material is received, it is sorted by quality (mainly Btu, but water, chlorine, and solids content are also important). The fuel blender processes batches of waste to meet the basic fuel specifications required for acceptance at a cement kiln. This processing may include the processing of higher viscosity material or materials with some solids via equipment such as shredders, hydro-pulpers, mixers, dispersers, or in similar physical processing devices to form a more uniform fuel blend. Typically, a fuel blender will create a fuel blend that is as follows:

- 10,000 Btu/lb
- Up to 20% water
- Less than 2% halogens
- Up to 30% solids

In order to meet these fuel specifications, various qualities of compatible energy-bearing wastes are blended together. Much of the wastes that a blender receives have a modest heat value (between 5,000 and 10,000 Btu/lb).[40] Therefore, it is important that the fuel blender receive an adequate amount of waste with higher heat values in order to blend to meet the kiln specifications. ECF and streams similar to that are a critical piece of the blending mixture. Once a blend is prepared, it is shipped to a cement kiln in trucks or railcars.

ii. The loss of ECF would significantly impact the blending capabilities of the fuel blenders

SYA, in conjunction with Environomics and CKRC, has surveyed a number of fuel blenders that supply cement kilns as well as several cement kiln operators. This survey was conducted so that respondents could provide information to help characterize: (1) the quantities and qualities of the ECF waste streams that are currently being received at fuel blenders and cement kilns but could be lost if the rule is finalized; and (2) the impacts of those lost streams. The survey included the proposed ECF specifications to assist the respondents in analyzing the effects the rule would have on their operations. Kiln operators and blenders spent a considerable amount of time querying their databases on wastes received in order to identify the specific wastes that would meet the proposed concentration limits defining ECF and the volumes of such wastes that were received. The survey also asked facilities questions regarding how and why certain streams are blended and to what specifications they target to meet the fuel quality requirements of the cement kilns.

The survey was sent to a variety of fuel blenders, including those who received larger quantities of bulk waste versus others that processed more drummed material, including small quantity generator waste. We estimate that the survey represents about one-third of the US fuel blender market.

Likewise, the survey was sent to a number of cement kiln operators to gauge how the ECF proposal would affect their facilities. The 7 cement plants that were surveyed constitute half of the 14 HWC cement plants and represent 43% of the total tons of

[40] We note that a heat value of 5,000 Btu/lb is used here only as an example and that, as EPA has often noted, it does not represent a "bright line" minimum Btu level for valid energy recovery. It has been shown that cement kilns can recover usable energy from materials with much lower Btu levels.

HWDF burned. The survey was prepared by facilities representing the full range of kiln types, including wet process and dry, preheater/precalciner systems. To the extent that the survey covered both fuel blenders and cement kilns over a range of operations, we believe the survey is robust and fairly represents the fuel blending industry.

On the other hand, there are signs that chlorine levels in wastes are declining (due to significant reductions in the use of chlorinated solvents), and a lesser fraction of hazardous waste now seems to fail the ECF qualifications because of chlorine content than was the case previously. Among the sorts of higher Btu wastes that kilns seek as HWDF, the concentration of metals is rarely sufficiently high as to make the waste unsuitable for burning.

The following are some of the specific wastes that survey respondents identified as ECF:

- Chemical industry waste stream containing 30% toluene, 20% xylene, 20% polymers, and 20% water.
- Waste stream containing 0-50% heptane, 0-45% hexane, 0-45% aliphatic hydrocarbons, 0-80% isohexane, 0-5% ether, and 0-20% toluene.
- Waste stream containing 55% isopropyl acetate, 10% methyl ethyl ketone, 20% solids, 25% water.
- Waste stream containing 1- 99% acetone, 1-99% ethanol, 1-99% ethyl acetate, 1-99% isopropyl alcohol, 0-20% toluene, 0-50% water.

Our data shows that the typical fuel blend for cement kilns prepared by commercial fuel blenders contains approximately 15 to 25% ECF. This is not an insignificant figure. In addition, for fuel blenders to meet the specification for cement kilns, the loss of ECF will mean the possible elimination of certain waste streams that require blending with higher-quality waste such as ECF. While it is difficult to determine the exact quantities, most fuel blenders estimate that they would lose other non-blendable hazardous wastes of a quantity that would be in a range from one-half up to an equal volume of lost ECF. That is, for every ton of ECF that is lost, between one-half and one ton of other hazardous wastes would not be able to be blended to produce fuel usable at cement kilns. The amount of lost material may vary due to the uncertainty of the source of alternative blend stock. In some cases, alternative blend stock may be available depending upon location and cost. Due to a variety of reasons, higher Btu value fuel is less available currently.

The following are some of the specific streams that fuel blenders believe they would likely no longer be able to accept and blend if they lost the ECF:

- Low Btu bulk stream containing 0-5% acetone, 0-5% dimethyl hydantoin, 5-10% methanol, 1-10% sodium acetate, 80% water.
- Pharmaceutical industry waste that contains mixed flammable solvents with chlorine and water.

- Printing industry inks containing small quantities of flammable solvents, but a high percentage of viscous ink pigments.

Most of the hazardous waste that is lost because blendable ECF fuel is no longer available probably would require incineration in the future. Fuel blenders said overwhelmingly that if they were to lose ECF as a blend stock, they would have to send to incinerators the poorer quality hazardous wastes that they formerly blended with the ECF. This other hazardous waste is lower in Btu value and will require thermal treatment; thus, incineration is the most likely alternative outlet for these other hazardous wastes. Transferring of waste to incineration will result in net emissions increases because the waste that will be removed from fuel blending, and ultimately from cement kilns, will require replacement at the cement kilns with traditional fossil fuel, mainly coal. (The amount of fuel burned at cement kilns will remain the same and the amount of waste burned in incinerators will increase, thus total emissions will increase.) As detailed below, additional emissions will result from additional transportation of coal, plus additional emissions of certain criteria air pollutants for cement kilns. In some isolated cases, it is possible that wastes that may have been fuel blended could be shipped to landfills.[41]

b. ECF impact on the quality of fuel at the kiln

The loss of ECF also will have impacts at the fuel blending operation at the cement facilities, as well as reducing the amount of waste-derived fuel burned in cement kilns, as learned from surveying operators of fuel blending facilities located at cement facilities.

i. Cement kiln fuel blending

Each of the HWC cement kiln locations has blend tanks that enable the receipt of varying qualities of waste-derived fuel. For most kilns, the vast majority of the waste that is received is supplied by fuel blenders. However, kilns do receive some shipments directly from waste generators. Each kiln facility blends the fuel received from all sources to meet the quality specifications needed for efficient fueling of the cement kiln operation. For most facilities, this means blending the liquid fuel to a specific heat value, as well as to meet regulatory and operating requirements for constituents that may be contained in the fuel (e.g., metals, halogens, water). The basic objective is to create a fuel that will perform in the kiln as close as practicable to coal, cement kilns' principal fossil fuel. However, it is becoming increasingly difficult to find suitable blend stock to create a fuel that equals coal in heat value. As was discussed above for fuel blenders, the same market forces are in place for kiln operators that makes it difficult to find good quality hazardous waste fuel.

The source of fuel received at the cement kilns is from the following sources:

- Fuel blenders

[41] The only landfills that could accept these types of wastes are in Canada.

- Chemical and specialty chemical manufacturers
- Paints and coatings industry
- Semi-conductor industry
- Other manufacturing industries

Based on our survey results, kilns received very little wastes that would be excluded as ECF, largely because most kilns receive the bulk of their HWDF in an already-blended form from fuel blenders. The already-blended HWDF received by kilns usually does not meet the ECF specifications because of chlorine content (above the ECF limit, but less than 2%) or metals (relatively low levels that will not cause the kilns to exceed metals emission limits, but still higher than the ECF limits). ECF constitutes a much higher fraction of the wastes received by kilns directly from generators and of the wastes received by fuels blenders. The survey results showed that 15.5% of the wastes received by blenders from generators would qualify under the proposed rule as ECF. Kilns cited a roughly similar percentage of the wastes they receive directly from generators as likely qualifying as ECF. We thus estimate that 15.5% of all the liquid HWDF burned by kilns would qualify as ECF under the proposed rule, for a total of 146,000 tons per year (15.5% of the 938,000 total tons of liquid HWDF burned in cement kilns in 2006).

As part of the economic analysis for the proposed rule, EPA has determined that cement kilns will lose only 39% of the ECF that they currently receive (EPA estimates that cement kilns receive 123,300 tons/year of ECF, of which 48,400 tons, or 39%, will be lost due to the ECF rule.). We believe the actual ECF loss will be between EPA's estimate of 39%, or 57,000 tons per year (39% of 146,000 tons per year) and, in the worst case, the 146,000 tons per year noted above.

We also estimate that some waste that is not ECF will also be removed from fuel inputs to cement kilns due to the ECF rule. As noted above in the fuel blender discussion, ECF fuels are used to blend lower-quality liquid wastes and sludges. At worst-case, another 73,000 to 146,000 tons per year of additional hazardous waste are projected to be diverted from cement kiln fuel programs and, most likely, will be sent to incineration. Using EPA's estimate of 39% ECF loss, we calculate that the amount of other hazardous waste that may be diverted away from cement kilns is 28,000 to 57,000 tons per year. Based upon our analysis, we believe the amount of additional hazardous waste diverted from kilns will be 146,000 tons per year.

ii. <u>Waste-derived fuel impacts at cement kilns</u>

As noted above, at worst-case, approximately 146,000 tons of ECF, plus another 73,000 to 146,000 tons of hazardous waste-derived fuel will be removed from the cement kiln energy recovery programs. We estimate that for every ton of hazardous waste fuel lost, 0.95 tons of coal will need to be used to replace the lost waste fuel. In total, we believe that at worst-case, approximately 277,000 tons of coal will be required to replace the hazardous waste lost as a result of the impacts of theECF rule as proposed. Based upon EPA's estimates of ECF loss, up to 108,000 tons of coal may be required to replace lost hazardous waste. From an overall standpoint of the effects of the proposed ECF rule, this translates to a net decrease in energy recovery as opposed to creating additional energy recovery that EPA originally stated as one underlying purpose of the ECF rule.[42]

iii. <u>Secondary impacts at cement kilns</u>

The ECF proposed rule clearly has the effect of transferring the "cleanest" hazardous waste from one device that uses the materials as fuel to another type of device. However, this does not reduce emissions from combustion or transportation and storage. In fact, the transfer of ECF wastes to boilers will actually cause a significant net increase in emissions to the environment. Fuels needed to replace lost ECF will likely result in increases in emissions due to higher rates of coal combustion.

1. Information is available that shows that emissions of certain pollutants from kilns that burn coal are higher than for those that burn hazardous waste. In particular, studies have shown that NO_x and SO_2 are lower when kilns utilize hazardous waste as fuel.[43,44] One study has shown that NO_x and SO_2 are reduced by up to 60% and 75%, respectively, when hazardous waste is burned compared to the burning of coal. NO_x reduction is accomplished because the liquid waste fuel results in lower combustion zone flame temperatures, which reduces the formation of thermal NO_x. The lowering of the flame zone temperature is a result of the generally lower heating value of waste fuel (as compared to coal), plus the addition of higher amounts of water that are a part of the waste fuel. Reduction in sulfur dioxide is partially a result of the low sulfur content typical of waste fuel. The sulfur content in coal is usually much higher.

   Based upon the data for cement kilns burning hazardous waste in 2006, increases in NO_x and SO_2 emissions would result. We have determined that if kilns had to replace the lost ECF with coal coupled with the loss of additional hazardous waste fuel because of the lost ability to blend some fuels (a worst-case total of 292,000 tons per year or 31.1% of the fuel burned in cement kilns), increases of NO_x and SO_2 are likely. Table 11 shows the estimated increases in NO_x and SO_2 emissions. The increases are also estimated based upon EPA's assumed ECF percent impact (loss of 114,000 tons per year). Due to the loss of ECF and other fuels that could not be blended with ECF, we have very conservatively assumed only a 9.3% and 15.5% increase (only 3.6% and 6% for EPA's estimated ECF loss) in the emissions of NO_x and SO_2 from current emissions, respectively.

[42] 72 FR 23273.
[43] Robert J. Schreiber, Jr., P.E., Scott J. Kellerman, PhD., Carol A. Schreiber, "Comparison of Criteria Pollutants for Cement kilns Burning Coal and Hazardous Waste Fuels", Air & Waste Management Association Waste Combustion in Boilers and Industrial Furnaces, March 26-27, 1996.
[44] "It has also been proposed that the use of SLF [solvent like fuel] at a fuel input level of 40% reduced NO_x emission levels by 50%, (House of Lords 1999). It was also reported that the wide variability in NO_x emissions from wet kilns was reduced by the use of SLF (House of Lords 1999)." House of Lords. Waste Incineration, House of Lords Select Committee on the European Communities, Session 1998-99, 11th Report Waste Incineration, HL Paper 71, HMSO, London, 1999.

Table 11 - Increase in NO_x and SO_2 Emissions

Pollutant	Worst-case Assumptions	EPA 39% ECF Loss
	Increase in Emissions, Tons/year	Increase in Emissions, Tons/year
NO_x	4,256	1,660
SO_2	6,502	2,536

Further, with the loss of ECF from cement kilns, the remaining waste-derived fuel will have a higher concentration of contaminants, particularly metals. As noted above, the ECF performs the function of providing cement kilns with a base of high-quality fuel to blend lower-quality wastes. Many of these lower-quality wastes contain modest amounts of metals. Losing the ECF will mean the average concentration of metals fed to the kilns will increase.[45] ECF by definition must meet the comparable fuel specifications. The concentration of metals in the comparable fuel specification is lower than is typically found in hazardous wastes normally received at cement kilns. Given that a cement kiln has a given system removal efficiency for metals, increasing the concentration of metals in the fuel will mean a higher concentration of metals in the stack emissions, even though regulatory emission limits will still be met. Table 12 presents an example of the increase in emissions that might result at a typical facility, using SVM (lead and cadmium) as an example.

As the data indicates, losing ECF will have a detrimental effect upon the metals concentration in stack emissions from HWC cement kilns.

[45] Note the increase in metals emissions can occur with kilns still meeting the regulatory emission limits.

Table 12 - Metal Emission Concentration Increase Example

		HWDF:	17 tph		
SVM	**SRE**	**Stack:**	295,000 dscfm	8,354	dscm/min
Facility "N"	99.6837 %		3.3 % O2	501,226	dscm/hr
				395,855	dscm/hr @ 7% O2

Three years historical data:

SVM in HWDF Average	214 ppm SVM
Metal Input:	3303.3 g/hr of SVM
Emissions:	26.4 ug/dscm@7%O2
ECF Fuel Maximum Allowable to Meet Comp Fuel Spec:	31 ppm Pb
	1.2 ppm Cd (non-detect)
	32.2 ppm SVM
Percent of fuel that is currently ECF:	15.5%
Adjusted SVM based on loss of ECF Fuel:	247.3 ppm SVM

Emissions after loss of ECF:

Metal Input:	3818.1 g/hr of SVM
Emissions:	30.5 ug/dscm@7%O2
Increase in Emissions after Loss of ECF:	4.1 ug/dscm@7%O2
HWC MACT SVM Emission Standard: (Existing cement kilns)	330 ug/dscm@7%O2

2. If the ECF rule is promulgated as proposed, cement kilns will require additional coal to replace the lost ECF-derived hazardous waste fuel, as well as the loss of additional fuel that will not be blended. The amount of additional coal that may be required to be supplied to kilns is at worst-case approximately 277,000 tons per year. For EPA's estimate of ECF loss, up to 108,000 tons of coal per year may be necessary. There will be additional environmental impacts due to added transportation of the coal to cement kilns.

   To determine the environmental impacts, we assume that all of this coal will be supplied by rail. Table 13 provides details on the additional emissions of HC, CO, NO_x, PM, and SO_2 that will result from the transportation by rail for the additional coal (worst-case only is shown; EPA calculated impacts would be 39% of those shown below):

Table 13 - Increase in Emissions from Transportation of Additional Coal

Locomotive Line-haul Emission Factors

Year	(pounds per thousand gallons)				
	HC	CO	NOx	PM	SO2
2008	17.80	66.70	414.4	12.05	5.33

Assume:

1,000 miles for coal train to kiln

277,000 tons of coal to replace lost HWDF

Class I Railroad Data - 2002

Railroad	Thousands of Total Ton Miles	Ton-miles per gallon with Locomotives
BNSF	958,862,994	878.7
CSXT	469,392,729	913.0
GTC	104,578,305	968.2
NS	373,281,203	860.7
SOO	45,426,616	1076.5
UP	1,085,700,525	922.5
Total	3,074,806,305	**901.4**

Weighted average

Additional Emissions for Transporting Coal to Cement Plants

Year	(pounds of emissions)				
	HC	CO	NOx	PM	SO2
2008	5,470	20,497	127,345	3,703	1,638

Additional Emissions for Transporting Coal to Cement Plants

Year	(tons of emissions)				
	HC	CO	NOx	PM	SO2
2008	2.7	10.2	63.7	1.9	0.8

Data source:

Report No. SR2004-06-01, Revised Inventory Guidance for Locomotive Emissions, June 2004, Sierra Research, Inc., Sacramento, CA

3. CO_2 emissions will increase with the diversion of waste-derived fuels from cement kilns to boilers and to incinerators. (As noted earlier, some of the diverted wastes probably will go to incineration.) It has been reported that a cement kiln will reduce the amount of CO_2 emitted when burning solvent waste as compared to an incinerator.[46] The CO_2 emissions from burning 1 metric ton of waste in a cement kiln results in a net savings 2,609 kg CO_2/ton of solvent waste vs. burning the waste in an incinerator without energy recovery. Assuming a worst-case loss of 146,000 tons of waste that may additionally have to be incinerated, the additional CO_2 generated would be approximately 380,000 tons per year. Using EPA's estimate of the 39% of ECF loss, or 57,000 tons per year diverted to incineration, the additional CO_2 generated would be about 149,000 tons per year.

iv. Cement kilns burning hazardous waste will have to meet the Final HWC MACT emission standards in 2008

These standards include "thermal" standards for SVM and LVM metals. The new standards include SVM and LVM limits in terms of mass of metal emitted per million Btu of hazardous waste that is fed. As was noted in the above comments, the loss of ECF will result in an increase in the average concentration of metal in the waste fuel. With the further reduction in average heat value of the hazardous waste due to the loss of ECF, the negative impact to the kiln's ability to comply with the thermal standards is two-fold. Not only is the metal concentration increasing, but the Btu/lb heat value is decreasing. This will make compliance with these standards more difficult since in the demonstration of compliance the numerator (mass of metals) is increasing and the denominator (Btu/lb value) is decreasing. Meanwhile, the wastes that would be transferred to boilers would not be subject to the HWC MACT standards.

[46] Environmental Benefits of Using Alternative Fuels in Cement Production, A Life-Cycle Approach, CEMBUREAU - the European Cement Association; www.wbcsd.org/web/projects/cement/tf2/CEMBUREAU.pdf.

III. Technical Issues with the Evaluation of ECF Chemicals and Data Analysis

Comments are provided in this section on the ECF chemicals and their basis for exclusion from the definition of solid waste.

a. Legitimacy for the ECF chemical exclusion

Following are several concerns regarding EPA's process of identifying constituents that would not have limits under the ECF exclusion.

i. Relative hazard issues

We have several comments regarding relative hazard discussions:

1. The Waste Minimization Prioritization Tool (WMPT) does not consider dose or actual exposure in its factors to determine an overall risk score for a chemical. The WMPT only considers the hazard potential of the chemicals evaluated. That is, it scores each chemical based on toxicity, persistence, and bioaccumulation potential. It does not evaluate the potential for the chemical to be present in the environment where it can be a concern for human health and the environment. However, any consideration of risk to human health and the environment must consider the dose. For example, the polycyclic aromatic hydrocarbons (PAHs) have relatively high WMPT scores indicating relatively high toxicity, persistence, and bioaccumulation potential of these chemicals. However, the risk to human health and the environment from these chemicals is also a function of the amount of these chemicals that are released to the environment. WMPT does not account for the release potential from the source. The overall risk to human health and the environment from PAHs may be lower if the amount released to the environment is less than the amount released from a chemical with lower hazard potential (toxicity, persistence, and bioaccumulation potential) but that is emitted to the environment in larger quantities. Therefore, not including dose in the risk ranking process does not provide a true picture of the overall risk to human health and the environment.

2. EPA chose to group all of the PAHs together for the risk ranking by selecting the highest individual PAH WMPT score as representative of all PAHs. EPA states that this was done to be consistent with the TRI[47]. EPA further requests comments on adopting the WMPT (and TRI) policy of classifying PAHs as a group, and "being consistent with the Agency's priority to reduce the environmental release of chemicals on EPA's list of priority chemicals."[48] To be consistent with the TRI and to follow the Agency's priority to reduce release of the priority chemicals does not appear to have any relevance to the purpose of categorizing the 37 chemicals for the comparable fuels exclusion.

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[47] USEPA, "Draft Technical Support Document for the Expansion of the Comparable Fuels Exclusion," May 2007, page 14.
[48] 72 FR 33317.

3. One of the factors in determining exposure potential within WMPT is the persistence factor. The persistence factor for each chemical is taken as the larger of the half-life values for each media considered. The media considered for the persistence factor includes water, soil, and sediment; but does not include air. Air half-life data is not used within WMPT because it is not considered consistent with the Toxic Release Inventory (TRI) Persistent, Bioaccumulative and Toxic Chemicals (PBT) Rule and Pre-manufacture Notices Final Rule Notice (PMN FRN) for which the tool was developed. However, air half-life is important when considering risk from ECF stack emissions and should be considered by EPA as part of this analysis. Interestingly, and contradicting EPA's half-life approach, when evaluating those compounds that did not have a WMPT score in the "high hazard" category, EPA considers the inhalation pathway as particularly important.

4. No toxicity data was available for five of the 37 constituents examined with WMPT. Based on persistence and bioaccumulation scores alone, EPA concluded that none of these compounds ranked higher than Category C. As stated by one of the peer review panel members, the absence of information should not imply acceptable hazard.

While Items 3 and 4 by themselves might not change the overall classification of the ECF compounds, together these issues, along with the other issues raised concerning the WMPT approach, raise the concern for the overall process. It is acknowledged that the WMPT is a screening-level tool; however, to ensure that ECF emissions are protective of human health and the environment, a more detailed approach with consideration for potential dose and other site-specific factors is warranted.

ii. Benzene issues

EPA categorized benzene as a Category B constituent. The higher WMPT score for benzene was based on ecological concern and alone did not qualify benzene for Category A. In evaluating what constituents to place in Category B, EPA identified those chemicals with WMPT human toxicity scores based on inhalation as the driving exposure pathway. Benzene is a known carcinogen via the inhalation exposure pathway; thus, EPA categorized benzene as a Category B constituent. The three peer reviewers for the use of the WMPT came to different conclusions regarding the categorization of benzene.

One peer reviewer stated that using sediment half-life might result in an overly conservative persistence score considering that stack emissions are unlikely to reach anaerobic sediments in significant quantities and then stated that one could argue benzene might be more appropriately considered to have a lower persistence score and hence placed in Category C. Another peer reviewer stated that, because of the level of concern associated with benzene (a known human carcinogen), benzene should be placed in Category A. The third peer reviewer thought that benzene was appropriately placed in Category B but indicated that the persistence score for benzene should be more appropriately based on the air half-life rather than on sediment half-life.

This lack of agreement among the peer reviewers highlights the fact that the WMPT process for hazard ranking is at best a screening-level process. As one peer reviewer noted, "...although the WMPT is a useful screening tool for evaluating the hazard of particular compounds it should not be used blindly."

b. EPA's use of "de minimis" as it applies to the emission data and the contradiction of those levels to MACT limits

The term de minimis should be defined and used by EPA more clearly and consistently in addressing boiler emissions. Several inconsistencies and concerns with this terminology are described in this section. EPA has used the term "*de minimis*" in a number of instances in the proposed rule. For example:

- Page 33291: "For seven exceedances, hazardous waste boiler emissions were at trace levels[22]—there was a de minimis increase in emissions. (Footnote 22: Emissions of 8 μg/dscm for high molecular weight compounds such as these are equivalent to approximately 0.005 ppmv expressed as propane equivalents. Thus, these are de minimis concentrations considering that the hydrocarbon emission limit for boilers burning hazardous waste is 10 ppmv...)"
- Page 33292: "Average hazardous waste boiler emissions for each of these compounds are at trace levels—below 11 μg/dscm.[24] (Footnote 24: As discussed in footnote 22, emissions at this low concentration are in the *de minimis* range.)"
- Page 33314: "Specifically, there is one additional exceedance each for benz(a)anthracene and fluorine, and two additional exceedances for ethylbenzene. All of these are de minimis exceedances, however, with emissions below 1 μg/dscm."
- Page 33314: "There is also one additional exceedance for benzene, but the exceedance is de minimis given that the revised oil-fired boiler benchmark is 90 μg/dscm and the additional hazardous waste boiler exceedance is at an emission level of 91 μg/dscm."
- Page 33315: "The target emission levels for the three hazardous compounds for which we have oil emissions data—acrolein, benzene, and toluene—would range from a de minimis level of 20 μg/dscm[113] to 160 μg/dscm. The target emission levels for the seven hazardous compounds 115 for which we have only hazardous waste boiler emissions data would range from a de minimis level of 20 μg/dscm to 130 μg/dscm. And, the target emission level for hazardous compounds for which we do not have emissions data would be a de minimis level of 20 μg/dscm. (Footnote 113: It is reasonable to consider 20 μg/dscm a de minimis emission level because it is comparable to approximately 0.01 ppmv propane equivalents...)"

A common theme that can be gathered from the above is that EPA believes that any emission level at 20 μg/dscm or lower is considered de minimis for purposes of this proposed rule. This is striking because stack concentration emission standards for a number of MACT rules are lower than this presumed de minimis level. For example, the HWC MACT for new source Boilers has a mercury limit of 6.8 μg/dscm. The new source standard for Incinerators is 8.1 μg/dscm and the semi-volatile metals standard is 10 μg/dscm. New Municipal Waste Combustors must meet a 10 μg/dscm cadmium limit and all Other Solid Waste Incinerators (OSWI) must meet an 18 μg/dscm limit.

We also note that de minimis definitions can vary depending upon the purpose and expected use of the data. In a discussion document from an EPA Pollution Prevention Workgroup,[49] the following statement was made:

> *"Generally, de minimis levels in the range of 1 to 10% of a level requiring control measures are traditionally acceptable levels of insignificance."*

The 20 μg/dscm de minimis level would, based upon the above, indicate that a level of 200 to 2,000 μg/dscm would be a level at which controls of these compounds would be necessary. Our experience is that for ECF compounds, emissions at these control levels would be significant from a risk perspective.

EPA has made no attempt to describe the basis for these de minimis levels except to compare them to ppm levels of propane. In no way does the propane comparison lead to any relative hazard or emission control level. As EPA is aware, even minute quantities of compounds can be extremely hazardous to human health and the environment. Thus, lacking context for the propane comparison, the de minimis levels are of little value.

With respect to risk, we note that benzene (one of the ECF chemicals) emissions have significant associated risks. EPA has noted that certain air concentrations will subject individuals to the following risks[50] as shown in Table 14.

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[49] Industrial Combustion Coordinated Rulemaking Pollution Prevention Subgroup at the April 28 - 29, 1998 meeting of the Industrial Combustion Coordinated Rulemaking (ICCR) Federal Advisory Committee.
[50] Low-dose linearity utilizing maximum likelihood estimates (Crump, 1992, 1994). http://www.atsdr.cdc.gov/HEC/CSEM/benzene/standards_regulations.html

Table 14 - Benzene Risks

Risk Level	Concentration
E-4 (1 in 10,000)	13.0 to 45.0 $\mu g/m^3$
E-5 (1 in 100,000)	1.3 to 4.5 $\mu g/m^3$
E-6 (1 in 1,000,000)	0.13 to 0.45 $\mu g/m^3$

Thus, we find it hard to understand how 20 μg/dscm can be called de minimis. In fact, we are aware that all cement kilns burning hazardous waste have had to perform site-specific risk assessments on their kiln emissions. In no case would any measured emission, much less one at 20 μg/dscm, be considered de minimis and, thus ignored in the risk analysis. To the contrary, when complying with MACT SVM (lead and cadmium) and LVM (arsenic, beryllium, chromium) standards, individual metals are analyzed during comprehensive performance testing of stack emissions. In most cases, at least one of the metals in each volatility group would fall below the 20 μg/dscm "de minimis" level. But EPA has allowed no facility to successfully argue that a value of that magnitude is de minimis and should be ignored for risk analysis purposes. As a matter of fact, in the April 19, 1996 HWC MACT proposed rule Federal Register, page 17447 (footnote 178), EPA uses the term de minimis and notes:

> "*...the term de minimis means simply low concentration of metals or chlorine. It does not denote or imply low risk".* (emphasis added)

Also, we note that the minimum detection levels for VOC testing typically target emission levels of 2.5 μg/dscm. The 20 μg/dscm level is well above what can reasonably be measured and thus, is not de minimis in that context.

EPA has failed to recognize that, even though an emission may be equivalent to a low concentration of propane, that does not mean the emission is de minimis. EPA ignores the toxicity of the compound and what effect that may have on human health and the environment at a given emission level. Therefore, EPA's use of de minimis in this proposed rulemaking is contrary to EPA's other uses of the term and is fatally flawed.

IV. Technical Comments on EPA's Regulatory Approach

With the classification of ECF as exempt from solid waste regulation, the regulatory controls for compounds so exempted would be minimal at best. Under this rule, an off-site boiler that has never burned hazardous waste can take ECF without a RCRA permit or a CAA permit (conceivably). RCRA permitting deals with site-specific conditions that have not been addressed at all in this rule, since data is only reviewed for some boilers and is not comprehensive. The background document, Section 5 states, "The operating conditions would be at least as stringent as those for RCRA-permitted hazardous waste boilers." How can this claim be made when RCRA permitting is performed on a site-specific basis? By exempting ECF from the definition of solid waste, the boilers will also not need to meet the HWC MACT rules, which were written to make sure that devices burning hazardous waste were regulated beyond RCRA.

Not only would a boiler burning ECF be drastically less regulated than a cement kiln burning the same waste, but EPA's stated purpose for the ECF exclusion playing a role in national energy recovery policy is interesting considering the same waste is already being used for energy recovery in cement kilns. EPA's Unified Agenda (72 FR 23273, April 30, 2007) expresses EPA's intent as follows:

> *"2973. EXPANDING THE COMPARABLE FUELS EXCLUSION UNDER RCRA Abstract: EPA currently excludes specific industrial wastes, also known as comparable fuels, from most Resource Conservation and Recovery Act (RCRA) hazardous waste management requirements when the wastes are used for energy production and do not contain hazardous constituent levels that exceed those found in a typical benchmark fuel that facilities would otherwise use. Using such wastes as fuel saves energy by reducing the amount of hazardous waste that would otherwise be treated and disposed; promotes energy production from a domestic, renewable source; and reduces use of fossil fuels. With an interest in supplementing the Nation's energy supplies and to ensure that energy sources are managed only to the degree necessary to protect human health and the environment, EPA, as part of the Resource Conservation Challenge, is examining the effectiveness of the current comparable fuel program and considering whether other industrial wastes could be safely used as fuel as well."*

This statement is most interesting considering both its false claims about increased energy recovery and its unusual conclusion that waste could be burned without regulation in one industrial unit (purportedly in a manner protective human health and the environment), while the combustion of the same waste in another industrial unit would be intensively regulated (presumably to ensure human health and the environment are protected).

EPA recognizes that the energy recovery of ECF wastes is already occurring:

> *"However, expanding the comparable fuel exclusion may not substantially increase the amount of hazardous waste burned for energy recovery because high Btu wastes, even though not currently excluded from RCRA, are currently burned in industrial furnaces and incinerators for their fuel value. Nonetheless, continuing to regulate these waste-derived fuels as hazardous wastes would treat*

a potentially valuable fuel commodity (especially considering the increasing value of fuels) as a waste without a compelling basis."[51]

However, EPA appears to disregard its own statement by the end of that footnote.

Also, the last paragraph in the Unified Agenda notice (72 FR 23273) emphasizing the importance of *"ensuring that energy sources are managed only to the degree necessary to protect human health and the environment"* is especially interesting considering the Agency's massive long-term effort to continually reassess and further regulate combustion of the same fuels being used currently in the cement industry (as part of the hazardous waste combustor universe). The industry has been through many rounds of rulemakings to make the required studies and regulatory controls more stringent despite the positive effects of energy recovery and despite years of results (from emissions testing and risk assessment) showing cement kilns' ability to effectively destroy the organic components of the waste in a manner that does not adversely affect human health and the environment. But EPA is proposing to waive for industrial boilers the requirement to prove impacts to human health and the environment; all based on a minor mid-80s DRE study and no site-specific risk assessments.

[51] USEPA, "Draft Technical Support Document for the Expansion of the Comparable Fuels Exclusion," May 2007, page 3.

V. Evaluation of the Risk Assessment Process Performed in Support of the ECF Exclusion

EPA has conducted only a general risk analysis as opposed to a detailed technical analysis to justify the ECF expanded exclusion. One of EPA's stated goals for evaluating risk was to "assess whether emissions of toxic organic compounds" from boilers "could be expected to be comparable to emissions from oil-fired industrial boilers". This presents an interesting approach to evaluating risk considering all of the history on evaluating risk for burning waste-derived fuel under the RCRA regulations.

First, the emissions (and thus resulting risk) from boilers are being compared between fuel types as opposed to how EPA has applied risk assessment for other burners. For example, for cement kilns, which also are industrial devices that have replaced normal fossil fuels with energy-bearing wastes, EPA has insisted on evaluating total risk from the overall process as opposed to a comparison with a benchmark, such as normal (fossil fuel) operations. This has resulted in the cement facilities performing extensive and expensive studies on a site-specific basis to demonstrate that the emissions from an industrial process (which happens to include the use of waste fuels) does not have a negative impact on human health and the environment. Then, RCRA permit conditions are based on the results of those assessments; whether or not the emissions are caused by waste fuels (e.g., most organic emissions have been demonstrated by the industry, and recognized by EPA, to be from the manufacture of cement, not from fuel burning).

Second, as described previously, in this proposal EPA is comparing boilers' hypothetical ECF emissions to emissions when using fuel oil without considering what fuel the facilities are actually using. For boilers using natural gas, the results of the analysis EPA conducted is in no way representative of the change in emissions that would have been revealed if EPA used natural gas as the benchmark in the analysis, as natural gas is known to be a "clean"-burning fuel. EPA's own documentation shows that, *"Most liquid fuel boilers that burn hazardous waste co-fire the hazardous waste fuel with natural gas"* (1997, "Draft Technical Support Document for HWC MACT Standards (NODA), Volume II: Evaluation of CO/HC and DRE Database, April 1997" Page 25-4).

a. Specific risk assessment shortcomings of the rule

EPA's analysis uses boiler emissions from hazardous waste (HW) burners due to lack of emissions data for ECF burners. It is quite likely that the HW burners were operating under very specific conditions required by the BIF rules when they were tested. EPA states that this is representative because the ECF boilers would be operated "under conditions that ensure good combustion efficiency". That is quite a stretch considering that the conditional good combustion provisions of the ECF proposal are completely self-implementing and a very light version of the very prescriptive nature of waste combustion regulatory requirements under RCRA and the CAA. EPA states that, "*The operating conditions would be at least as stringent as those for RCRA-permitted hazardous waste boilers,*" which is an odd assessment considering the last 20 years of EPA prioritizing as extremely important its intense regulatory oversight and permitting activity (including extensive testing and risk assessment) for any facility that burns hazardous waste. Regardless whether energy recovery has been involved, EPA has made sure that every detail of the emissions and potential impact on human health and the environment are rigorously proven. To now waive this level of oversight for one particular industrial sector is completely contrary to over 20 years of EPA behavior and the public's expectations of the Agency's adherence to its mission.

With respect to non-dioxin organic emissions, EPA notes in the preamble that PAHs will not be emitted from boilers because they are not allowed to be included in unlimited quantities in fuel. The technical discussion describes the capability of a boiler, like other combustors, to have sufficiently high DREs. Even if PAHs are not in the fuel in regulated quantities, what basis is being used to determine that they are never emitted as PICs? As with other combustors, it is still likely that organic emissions have their origin from PICs and not just from that small fraction of the constituents of fuel that are not completely destroyed. So how can EPA assume no PAHs from combustion emissions in this case? As with other waste combustion devices, boilers should undergo RCRA permitting to ensure that testing is performed to demonstrate the low level of emissions; and to employ risk assessment to determine if there is risk from these emissions. EPA's partial body of data in this rulemaking and its very generic, non-specific, and non-detailed approach to risk assessment cannot replace the need for a full evaluation.

In reviewing the details of EPA's emission data analysis, we were shocked at its lack of detail considering the much higher level of scrutiny the Agency has always applied to other hazardous waste combustors. Most of the organic emissions data is explained away as either a non-detect, a partial non-detect, a de minimis level, close to a de minimis level, an outlier, a lab contaminant, different operating conditions from ECF exclusion requirements, etc.[52] In the world of RCRA testing and permitting oversight, EPA would never allow these types of excuses to eliminate data and avoid close analysis without a detailed assessment with clear rationale for the exclusions. As an example, EPA's description of eliminating non-detects based on any data noted with a "<" is vastly different than the methodology applied to the use of emissions data in risk assessments for hazardous waste combustion facilities regulated under RCRA.[53] For example, non-detect levels must be used for "constituents of concern" that are identified and approved in the risk assessment protocol by the Agency. For other compounds, if only one test run has a measured level, all other non-detect measurements must be included in the calculation of the average emissions. Again, the lack of site-specific information and analysis available to support the conclusion that human health and the environment are not impacted by boilers burning ECF is irresponsible and completely inconsistent with prior EPA practices.

[52] See Section 5.1.3, USEPA, "Draft Technical Support Document for the Expansion of the Comparable Fuels Exclusion," May 2007, page 45.
[53] Ibid, page 43.

EPA's Margin of Exposure (MOE) analysis performed originally for the Phase II hazardous waste combustor MACT for boilers and revised for the ECF proposed rule is also lacking:

- EPA has barely addressed the long list of site-specific variables that can exist at different facilities and different site conditions that all factor into the estimation of risk.
- EPA has used statistical analysis at varying percentiles to "adjust the margin of exposure;" however, when individual facilities are required to evaluate emissions from hazardous waste combustion for purposes of risk evaluation, EPA requires use of actual emissions that are representative of normal, or more typically, "worst-case," operating conditions. EPA never allows use of a statistical approach to measured emissions (greater than non-detect) for use in risk assessments for individual facilities. At best, EPA only allows for statistical approaches to quantify non-detect concentrations of constituents of concern.[54]
- EPA has expressed resulting risk in terms of safety margins. The safety margin analysis does not compare to the approach typically required for hazardous waste combustors, as described below.

Considering the lack of specific emissions data (where some boiler dioxin/furan data does exceed 0.40 TEQ ng/dscm), the lack of site-specific or boiler-specific risk assessment inputs, and the proximity of the results to the risk thresholds, we believe that EPA has completely failed to demonstrate protectiveness to human health and the environment. If this evaluation is EPA's way of saying that all the existing regulatory requirements for waste combustion are really not necessary to protect human health and the environment, then why are other industrial sources required to continue complying with the more stringent approaches? And, if that is not what EPA is saying, then EPA has not prepared an adequate analysis of the risks associated with ECF combustion in boilers.

b. Lack of specific knowledge on dioxin/furan emissions and associated risks

The Agency states that "*boilers that burn coal as the primary fuel are exempt from this requirement because sulfur in coal is known to inhibit PCDD/F formation.*"[55]If burning of coal is known to eliminate the need to evaluate dioxin/furan emissions, then why do cement kilns still have to evaluate dioxin/furan emissions? This casual dismissal of issues is very different than the way RCRA and MACT are typically implemented. EPA's approach to boilers' dioxin/furan emissions in the ECF proposal is merely a guess for a pollutant that is typically "driving" risk assessments due to the conservative nature by which it is analyzed. Despite the process measures in cement kilns that have been demonstrated to control dioxin/furan emissions; cements kilns still are required to measure dioxin/furan emissions every 2.5 years. Thus, if the kiln emissions were evaluated the same (i.e., in comparison to a benchmark fuel) as EPA says is adequate for

[54] Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities, EPA530-R-05-006, September 2005, p 2-85.
[55] 72 FR 33298.

boilers in the ECF rule, there would no longer be a need to evaluate dioxin/furan emissions or perform a risk assessment for evaluating HW combustion.

It is again astonishing how EPA simply wishes away any real potential for dioxin/furan formation in boilers, when the Agency mandates that dioxin/furan emissions must be specifically measured and evaluated per the Human Health Risk Assessment Protocol (HHRAP) guidance for any other device burning hazardous waste. Due to the conservativeness of the HHRAP guidance in evaluating dioxin compounds (in addition to the fact that the emissions levels input to risk assessments represent the performance of the entire process, not just the difference in emissions between fuel types), dioxin/furan is often a "risk-driver" (i.e., one of the constituents closer to a risk threshold than others) and is almost always scrutinized in RCRA-permitting of hazardous waste combustors). EPA's dismissal of risk evaluation of any boiler without an APCD or any boiler that burns coal is not technically justified. The documentation provided by EPA is speculative, at best, and apparently based on a quick analysis of some theories. The analysis lacks a risk assessment of actual emission data of all compounds for ECF combustion. EPA needs to justify this approach as protective of human health and the environment in specific comparison to the much more stringent requirements it imposes on all other waste combustion units.

Additionally, EPA notes in the Technical Background Document that a dioxin/furan emissions level below 0.40 ng TEQ/dscm is "generally considered *de minimis.*" First, the term de minimis is not typically applied to hazardous waste combustion emissions, as is described in a previous section. Second, the other part of the dual dioxin/furan standard for many hazardous waste combustors (e.g., cement kilns and incinerators) is 0.20 ng TEQ/dscm, which must mean that emission level is also de minimis. Third, why is EPA still requiring risk assessment for other hazardous waste combustors that operate at these purported "de minimis" levels? And why are emissions at these levels and even lower found to be risk-drivers (i.e., closer to the thresholds compared to all other organic constituents) if they are truly de minimis?

EPA needs to reconsider ECF boilers' potential to emit dioxin/furan and the necessity for similar testing and evaluation as is required of all other HW combustion devices (see prior discussion on boiler's potential for dioxin/furan formation). Further, the evaluation of emissions is typically coupled with an evaluation of the risk based on those emissions. Compared to the importance EPA has placed on performing detailed multi-pathway risk assessments, the approach performed for the ECF rule is crude and non-conclusive. Most hazardous waste permitting decisions have been made based on considering the results of a detailed risk assessment that typically takes multiple years and hundreds of thousands of dollars ($300,000 per the Technical Background Document[56]). If one could really count on simple comparisons to extrapolate results between different types of combustors and individual facilities, then why is all the time and money being spent for other facilities? EPA has ignored the fact that dioxin/furan emissions have been shown to be considerably variable across industry types, individual facilities, and test-to-test within a

[56] USEPA, "Draft Technical Support Document for the Expansion of the Comparable Fuels Exclusion," May 2007, p. 78, footnote 111.

particular facility. Thus, the analysis performed in the ECF rule for predicting dioxin/furan emissions in no way can assure the public that ECF boilers' emissions are safe.

c. Legitimacy of EPA's risk analysis

The risk comparison EPA performed in this proposed rule demonstrates a safety factor that is expected based on emissions data that was available and a very cursory general risk evaluation. As a comparison, RCRA permit writers have required up to a 50- to 100-times safety factor for constituents that do not have a permitted limit to ensure long-term protection of human health and the environment.

In the risk analysis in the proposed rule, EPA has adjusted the safety margins for incinerators from the 1985 to the 2003 Dioxin Slope Factor (DSF), showing the risks are nearing the established thresholds as shown in Table 15; however, the background document[57] uses only the 1985 DSF for boilers. For ease of evaluation, EPA extrapolated the 2003 DSF for incinerators to boilers, as shown in Table 16. With respect to what compounds drive the risk for a source, all of the boiler dioxin emissions (90, 95, and 99th percentiles) using the 2003 DSF are risk drivers (i.e., are close to the established thresholds). This indicates that the risk from dioxins associated with boiler operations with ECF may be more significant than EPA has stated.

EPA's conclusion on risk, as summarized in the technical background document[58], describes the ambiguous and uncertain results of the analysis performed. This is certainly not the type of study typically performed to determine an adequate level of protection of human health and the environment.

The following are examples of EPA's conclusion in the background document:[59]

i. The emission-adjusted MOE analysis should be considered a rough gauge of protectiveness.
ii. The emissions database itself is subject to substantial uncertainty.
iii. Use of the MOE analysis alone introduces greater uncertainty than for the MACT Phase II comparative risk evaluation.
iv. (footnote 74[60]) We note, however, that there is no reason to believe that these parameters (e.g., stack parameters, location, nearby land use) would be any different for the universe of ECF boilers than for the universe of MACT HW boilers.

[57] Ibid, p. 57.
[58] Ibid, pp. 58 - 59.
[59] Ibid, pp. 58 - 59.
[60] Ibid, p. 59

Table 15 - Adjusted Slope Factors for Incinerators Complying with MACT

Phase I - All Incinerators Complying w/ MACT	90th Percentile	95th Percentile	99th Percentile
1985 Dioxin Slope Factor	50	20	10
2003 Dioxin Slope Factor	8	4	1.7

Table 16 - Slope Factor Extrapolated to Boilers

ECF Predicted MOEs for 90th to 99th Percentile Risk Distributions			
ECF Boilers	**90th Percentile**	**95th Percentile**	**99th Percentile**
1985 Dioxin Slope Factor	**130**	**50**	**30**
2003 Dioxin Slope Factor (assuming the same ratio compared to 1985 DSF as shown for incinerators)	**20.8**	**10**	**5.1**

In addition, in the ECF proposed rule language (footnote 30)[61], EPA states the uncertainty of the process as follows:

> *"It must be emphasized that emission-adjusted MOEs should not be construed as predictions of the level of risk. Instead, they are only intended to provide an indication of whether risks could exceed a level of concern based on simplifying assumptions and as such, are subject to some level of uncertainty."*

When considering EPA's notes, in addition to the other concerns stated above, we do not believe that these statements represent a well-evaluated assessment of risk that demonstrates the high level of protection of human health and the environment that the Agency usually insists upon for waste combustors.

[61] 72 FR 33293.

VI. ECF Transportation and Storage Issues

SYA has numerous comments on EPA's assessment of transportation and storage issues related to ECF as we believe EPA has missed a number of important points.

a. ECF manifesting and related issues

Not using a hazardous waste manifest will preclude proper management of spill residues that occur in transit and will prevent generators from knowing that the entire volume of their ECF shipments arrive at the designated burner.

Management of ECF as a product would cause shipments to be managed solely within the existing requirements of the DOT regulations. This includes use of hazardous material shipping papers, assuming that the material will meet the criteria of a flammable or combustible liquid, use of containers meeting similar requirements, and proper marking and labeling of the containers as a hazardous material.. The key difference is the lack of the hazardous waste manifest, which provides the ability to transmit additional information regarding the waste codes associated with the ECF. This is most important in the event of a release in which the spill residue must be handled as a hazardous waste utilizing the waste codes associated with the ECF prior to the exemption. This issue is significantly different from the issues surrounding the shipment of virgin petroleum fuels. Therefore, we believe continued use of the hazardous waste manifest and its associated tracking and notifications procedures is necessary to ensure proper handling of the ECF.

b. Managing ECF as a "product" during transportation will not be protective in the event of a spill during transportation

The proposed regulation does not address how spill residues created during transportation are to be managed. Since the proposed rule (at 40 CFR 264.38(b)(13)) requires that residues in containers and tanks after cessation of operations are to be managed as solid wastes (and thus potentially hazardous wastes), residues from spills should also be managed in a consistent manner. A spill will have the same characteristics as the residues in tanks. We believe that leaving determination of the regulatory status of the spill residue to the transporter without the benefit of the generator's knowledge of the ECF will prevent proper management of the residue, especially if the ECF was derived from a listed waste.

c. Failure to manage residues remaining in shipping containers after unloading may result in improper mixing and combustion in inappropriate units

Since the ECF is to be managed as a product while it is in transportation (under the DOT regulations), when the container (tank truck or railcar) is unloaded the DOT rules require only that the shipping papers indicate the hazard of the residues but not the amount. Failure to ensure that the container be required to meet a RCRA-empty status (40 CFR 261.7) may allow a significant quantity of residue to remain in the transportation container, which then potentially could be improperly mixed into the subsequent load, which may be a virgin fuel product. We believe this issue has not been addressed within the proposed rule. The rule should require that containers be required to meet RCRA empty-status regulations.

d. SPCC requirements should also apply to comparable fuels

The preamble to the proposed rule suggests that SPCC controls are not needed at this time "*because we are not aware of evidence of improper storage of these comparable fuels.*"[62] If the risk of improper management exists, even if there is no evidence of improper storage, proper rules should be in place before a problem occurs, not after, in accordance with the cradle-to-grave intent of RCRA.

e. Allowing ECF emissions from tank storage to be managed under the Organic Liquid Distribution NESHAP (40 CFR 63 EEEE, aka OLD) will result in increased emissions due to less rigorous controls in many instances

As shown in the table below, the OLD rule, whether for existing or new tanks, does not provide for or require controls of breathing and working losses of volatile organic emissions for several situations that may exist. This results in a backsliding of emission controls from those that are currently required under the RCRA Subpart CC standards. This is especially true based on the definition of "existing source" as tanks constructed before April 2, 2002. This relatively recent date will ensure that most of the tanks in existence as of the effective date of this ECF rule will be considered to be existing under the OLD rule, and thus allowed to use the more lenient emission controls.

In addition, the basis for the standards that drive the emission controls is different (applicability based upon size of tanks and vapor pressure levels are different), with the proposed rule resulting in an increase in volatile organic emissions. The OLD rule bases its vapor pressure categories on the use of "annual average true vapor pressure," while the RCRA Subpart CC rules are based on the "maximum organic vapor pressure." Since the annual average vapor pressure will be lower than the maximum, an existing 21,000-gallon tank containing ECF with a maximum vapor pressure of 4.1 psia would be required under RCRA Subpart CC to use Level 2 controls (closed vent system vented to a control device), but under the OLD rule and the average annual vapor pressure threshold, that value would more than likely be less than 4.0 psia, resulting in no requirements for emission controls. Table 17 compares the emission control requirements of OLD and RCRA Subpart CC.

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[62] 72 FR 33309.

Table 17 - Comparison of Tank Emission Controls

Volume range[2] (gal)	VP (psia)	OLD (existing)[1]	OLD (new)[1]	RCRA Subpart CC
0-5,000	0-0.1	None	None	Level 1 or 2 (b.1.i.C)
	0.1-.75	None	None	Level 1 or 2 (b.1.i.C)
	.75-4.0	None	None	Level 1 or 2 (b.1.i.C)
	4.0-11.0	None	None	Level 1 or 2 (b.1.i.C)
	11.0-14.7	None	None	Level 2 (b.2)
5,000-10,000	0-0.1	None	None	Level 1 or 2 (b.1.i.C)
	0.1-.75	None	None	Level 1 or 2 (b.1.i.C)
	.75-4.0	None	None	Level 1 or 2 (b.1.i.C)
	4.0-11.0	A (2.1)	A (2.3)	Level 1 or 2 (b.1.i.C)
	11.0-14.7	B (2.6)	B (2.6)	Level 2 (b.2)
10,000-20,000	0-0.1	None	None	Level 1 or 2 (b.1.i.C)
	0.1-.75	None	A (2.4)	Level 1 or 2 (b.1.i.C)
	.75-4.0	None	A (2.4)	Level 1 or 2 (b.1.i.C)
	4.0-11.0	A (2.1)	A (2.4)	Level 1 or 2 (b.1.i.C)
	11.0-14.7	B (2.6)	B (2.6)	Level 2 (b.2)
20,000-40,000	0-0.1	None	None	Level 1 or 2 (b.1.i.B)
	0.1-.75	None	A (2.4)	Level 1 or 2 (b.1.i.B)
	.75-4.0	None	A (2.4)	Level 1 or 2 (b.1.i.B)
	4.0-11.0	A (2.1)	A (2.4)	Level 2 (b.2)
	11.0-14.7	B (2.6)	B (2.6)	Level 2 (b.2)
40,000-50,000	0-0.1	None	None	Level 1 or 2 (b.1.i.A)
	0.1-.75	None	A (2.4)	Level 1 or 2 (b.1.i.A)
	.75-4.0	None	A (2.4)	Level 2 (b.2)
	4.0-11.0	A (2.1)	A (2.4)	Level 2 (b.2)
	11.0-14.7	A(2.6)	A(2.6)	Level 2 (b.2)
50,000+	0-0.1	A (2.2)	A (2.5)	Level 1 or 2 (b.1.i.A)
	0.1-.75	A (2.2)	A (2.5)	Level 1 or 2 (b.1.i.A)
	.75-4.0	A (2.2)	A (2.5)	Level 2 (b.2)
	4.0-11.0	A (2.2)	A (2.5)	Level 2 (b.2)
	11.0-14.7	B (2.6)	B (2.6)	Level 2 (b.2)

[1]For the OLD rule references, the value in parentheses represents the Table and Section number from Appendix to 40 CFR 63 Subpart EEEE (the Organic Liquid Distribution NESHAP, aka, OLD rule).

[2]The volumes used for this table are approximate. The OLD rule uses these volumes as breakpoints, but the RCRA Subpart CC rules base the volumes on cubic meters, which results in breakpoints slightly less than then the OLD rule breakpoints.

RCRA CC refers to the 40 CFR 264 Subpart CC, Air Emission Standards for Tanks, Surface Impoundments, and Containers. The value in parentheses represents the citation from 40 CFR 264.1084.

A= 95% reduction of HAP, or Internal floating rood, or external floating roof, or vent to fuel gas system, or vapor balance to delivering vehicle.

B= Is the same as A above, except that the internal and external floating roof options provided by 40 CFR 63 subpart WW are not available.

Level 1 controls require a fixed roof with no cracks, gaps or openings, and all closure devices are closed except to provide access to the tank or to vent the tank through a spring-loaded relief valve. See 40 CFR 264.1084(c) for further details.

Level 2 controls require an internal or external floating roof, a tank vented through a closed vent system to a control device, a pressure tank, or a tank located in an enclosure which is vented through a closed vent system to a control device.

f. Management of residues in tanks and containers during operation is ignored

The proposed regulations at 40 CFR 261.38(b)(13) require that liquids and accumulated solids removed from tanks and containers after being taken out of service be managed as hazardous waste. However, the proposed rule would allow similar wastes generated while the units are in operation to be ignored. We believe that the ECF regulations should make clear that solids and other wastes generated as a result of ECF management operations be managed as hazardous waste no matter when they are generated. With some standards in place with the proposed ECF rule it maybe less worrisome to not consider the materials to be hazardous wastes while they are still in the management unit; however, once they are removed, the regulatory status should be applied at that time. This includes solids removed from the tanks during intermediate tank cleanings before the tank is to be taken out of service, waste removed by filtration units (filter bags or basket strainers), and materials such as spent personal protective equipment (PPE) generated from handling the ECF. This will ensure that wastes containing the specified components are managed appropriately.

g. Management of multiple ECF streams by a single burner should be addressed so that ECF residues are managed in the most protective manner

Boilers that manage multiple ECF streams will be faced with making a decision as to how to properly manage residues from the ECF storage and handling. We suggest that the regulations should make clear that, when determining the waste codes to apply to ECF residues to be managed as a hazardous waste, the "derived from" principle should be applied such that any and all listed waste codes that have been managed in the system since the last decontamination operation must be associated with the generated residues.

h. Exemption from closure requirements for ECF tanks exposes potential contamination sources

The proposed rule suggests that meeting the RCRA closure requirements is not necessary, as the "*owner/operator will take common sense steps to decontaminate and decommission the ECF storage unit if and when it goes out of service.*"[63] In addition, EPA "*encourages owner/operators to consult with the local regulatory authority as to the best way to ensure that the unit is cleaned properly.*"[64] As stated previously, ECF is considered to be more hazardous than the virgin fuels to which is supposedly is comparable. Thus, the removal of the closure requirements may not be sufficiently protective of the environment. We suggest that preparation of a closure procedure should be required and submitted to the local agency at least 90 days in advance of initiating closure activities. This plan would also include provisions to sample and potentially remediate soils in the area of the storage tanks and loading and/or unloading areas. The agency can then have an opportunity to review and modify the provisions as necessary,

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[63] 72 FR 33308.
[64] Ibid.

similar to the authority for the Director to require modifications to the SPCC Plan if it is found to be deficient.[65]

i. Financial assurance is needed to ensure that accumulated ECF is properly managed in the event of abandonment

If ECF is not managed in the manner that the regulations envision at 40 CFR 261.38, it must be managed as a hazardous waste. However, there is no provision for ensuring that generators or burners are financially prepared to dispose of accumulated ECF in this event. Generators and burners should be required to provide adequate financial assurance, similar to existing RCRA mechanisms, to manage this hazardous waste. Waiting until the ECF is mismanaged and only then imposing the applicable RCRA hazardous waste regulations, including the financial assurance regulations, may not result in adequate funds being available in the event that mismanagement and abandonment occurs. Considering EPA's current focus on ensuring adequate financial assurance,[66] the lack of coverage proposed for these units seems arbitrary and contrary to common sense. In fact, financial assurance has been, and continues to be, an important part of EPA's verification that finances are available to close hazardous waste and underground storage tanks, and not leaving the problem for local and state governments.

j. Allowing RCRA hazardous waste tanks to become "product" tanks overnight without proper closure could allow derived-from wastes to exit the management system without proper cleanup

The proposed rule (40 CFR 261.38(b)(14)) allows tanks managing waste that will become exempted ECF to be converted to product tanks without undergoing the closure required of all other hazardous waste tanks that may be changing service. This may allow wastes that were previously stored in the tank, included derived-from waste codes, to exit the RCRA management system without assurances that they have been properly managed. We believe the tanks should be required to undergo the closure identified in the site's existing contingency plan prior to being used as exempted ECF tanks.

k. The proposed ECF regulations are self-contradictory because they base the entire program on the similarities of emissions, but frequently point out that ECF is inherently more hazardous than virgin petroleum fuels, thus requiring additional storage and handling procedures

EPA's major argument for the exemption of ECF from the hazardous waste regulations is the similarity of emissions from the combustion of the ECF to the petroleum fuels that may also be combusted in the identified boilers. However, EPA frequently notes[67] that ECF is more hazardous than petroleum fuels due to the presence of certain hydrocarbons and oxygenates. For this reason, we believe EPA should be careful to not extend all oil-

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[65] Per 40 CFR 112.4.

[66] Continued EPA Leadership Will Support State Needs for Information and Guidance on RCRA Financial Assurance, Report No. 2005-P-00026, September 26, 2005.

[67] 72 FR 33290. 33295, 33300, 33302-33303, and 33311.

handling provisions to ECF without placing additional precautions on the management of the ECF to ensure management that continues to be protective of the environment.

l. Storage of ECF in underground tanks without the assurances of 40 CFR 280 regulations may result in problems similar to leaking underground storage tanks in the gasoline industry

We recommend that underground tanks not be allowed as an ECF storage unit unless they comply with full extent of the 40 CFR 273 regulations. Allowing the ECF to be managed as a petroleum fuel product in underground tanks may result in problems with leaking tanks similar to those experienced by the gasoline distribution (MTBE contamination) industry. EPA is dealing with oxygenates leaking from underground storage tanks, and the materials in ECF have the potential to cause similar problems. EPA acknowledges the increased hazards posed by ECF by stating that "*ECF can pose a greater hazard than oil, and in particular, because leaks of the hazardous organic compounds present in ECF are more likely than oil to sink into the ground and surrounding water, and therefore create a greater hazard.*"[68] Even though EPA is proposing to allow ECF to be managed as a "product" because the combustion emissions are purported to be similar to virgin fuels, this comparability does not extend to other management situations.

m. Use of "alternative engineered secondary containment systems" is not recommended

Alternative methods of secondary containment that are self-implementing may not be appropriate for the management of ECF. An alternative system may be appropriate when a duly authorized regulatory agency provides oversight, but the self-implementing nature of this rule does not ensure that adequate protective controls will be developed and implemented.

n. Self-implementing alternatives to the stated regulations should not be allowed

The SPCC regulations allow alternate management scenarios to be developed by the regulated entity. This may be appropriate for the management of fuel oil, but due to the more hazardous status of the ECF, self-implementing alternatives are a loophole waiting for abuse. We believe that only if the alternate management scenarios are provided with a means for regulatory oversight and approval should they be considered acceptable.

o. Arrangements with the Local Authorities should be incorporated into the SPCC Plan and providing the SPCC Plan to these organizations may be needed to ensure consistency with the displaced hazardous waste Contingency Plan requirements

The current Contingency Plan regulations (40 CFR 264 Subpart D) require that facilities provide a copy of the Contingency Plan to the emergency response agencies. However, the SPCC requirements do not provide for the sharing of the spill prevention document with local agencies. If EPA goes forward with the ECF exemption, then an additional provision should be required to ensure that agencies that would have received copies of

[68] 72 FR 33303.

the Contingency Plan on these same materials in the past, now receive the SPCC spill planning document.

p. Proposed "environmental due diligence" requirements to support a "reasonable efforts" provision for generators to avoid being required to manage their ECF as a hazardous waste in the event of non-compliance by a subsequent transporter or burner are appropriate

Frequent (semi-annual) site visits and evaluation of the storage and boiler systems may be needed to provide the generator with protection from problems occurring at the burner. The certification signed by an authorized representative as suggested in the preamble is also appropriate to ensure that the review and evaluation is given the appropriate level of attention at the generator facility. The frequency of the audits should be specified in the rule to ensure consistency among the facilities intending to utilize the ECF exemption. We suggest that the rules should also require maintaining records of these visits and evaluations for a minimum of three years from the date of the visit.

q. ECF should only be stored in tanks, tank cars, and tank trucks

EPA has requested comment on allowing storage of ECF in containers other than tank cars and tank trucks.[69] Our review of ECF streams indicates that most streams would be generated in larger quantities; therefore, ECF storage would be inappropriate for drums. Since ECF has the potential to have properties that are closer to hazardous waste rather than fuel, storage in tank drums without the associated controls (including monitoring, inspection, and air emissions) is not protective of human health and the environment. In addition, storage of ECF in drums may easily allow indiscriminate mixing of other wastes due to the lack of adequate controls. Thus, we agree with EPA that if this rule were to be made final, then ECF should only be stored in tank cars and tank trucks.

[69] 72 FR 33301.

VII. Miscellaneous Comments

In this section, we provide miscellaneous comments on additional areas that we believe EPA has not addressed in a manner that is adequately protective.

a. ECF should be referred to as a "contingently managed hazardous waste"

The proposed rule continually to refers to the ECF as a "product," when in actuality it would be a "contingently managed hazardous waste," similar to used oil (under 40 CFR 279) and universal wastes (under 40 CFR 273). We consider it a contingently managed hazardous waste because the waste will become hazardous if, for example, the storage tanks are not cleaned out within 90 days of closure. As stated, failure to properly designate and regulate ECF may lead to improper management.

b. Reporting – A mechanism is needed to allow the public to know the actual volumes generated and burned

The requirement for the initial annual estimate[70] would not allow citizens to understand what may be happening in their neighborhood. Given the proposed conversion of ECF to a "product" status, the information normally reported as part of the TRI program as generated waste will be lost for those TRI chemicals that may be contained in the ECF. We suggest that, at a minimum, both the generator and the burner should be required to report as part of the RCRA biennial reporting on the ECF generated, in addition to reporting the ECF components under the TRI program.

c. Restriction on Exports

Given that the ECF is proposed to be managed as a product, the export notification requirements of 40 CFR 262 Subpart H should apply. This would allow the receiving country to be properly notified and the ECF to be properly managed according to the receiving country's regulations.

d. Mismanagement of ECF

Provisions should be made to ensure that if a tank is used for ECF, and subsequently is mismanaged such that the ECF and the associated tank(s) must be managed as hazardous waste, then the tank should not be granted interim status, as this may be a loophole around gaining RCRA regulatory status without going through permitting. Instead, the new hazardous waste tank should be managed as a 90-day generator storage tank, and should be taken out of service rather than allow storage longer than 90 days as hazardous waste.

[70] Proposed 40 CFR 261.38(b)(2)(i)(D).

e. Initial notices by the generator and burner should be submitted in a manner that provides an opportunity for the regulatory agency to review them

Proposed 40 CFR 264.38(b)(2) and 40 CFR 264.38(c)(5) require the generator and burner, respectively, to submit initial notifications of their ECF activities prior to the first shipment or receipt. However, there is no provision for any specific amount of time prior to the activity that it must be submitted. If the ECF exclusion is promulgated, the regulations should be modified to require that the initial submittals be made at least 30 days prior to the activity to give the regulatory agency an opportunity to review the operation prior to the activity beginning. In addition, the initial generator notification should include a copy of the burner certification required by 40 CFR 261.38(b)(10) and a copy of the public notice. Also, a similar amount of time (30 days) should be required for the public notice prior to beginning activities, as specified in 40 CFR 261.38(b)(2)(ii).

f. Recordkeeping requirements

The recordkeeping requirements for burners specified at 40 CFR 261.38(c)(5)(iii) require that the facility keep records of who generates the ECF received, how much was delivered, and the date of delivery. However, there appears to be no requirement to document where the ECF is stored at the burner's facility and what boiler the ECF was burned in to ensure that it was burned in the correct unit. These provisions should be added to this provision.

V. Other Regulated Facilities Should Be Allowed to Burn ECF

As the proposed rule is written, only water-tube boilers may receive the exempt ECF. Despite the fact that we believe this ECF proposed rule contains many flaws and is not protective of human health and the environment, if an ECF rule should go forward, we believe it is important that other regulated combustion facilities should be allowed to receive and manage ECF under the same regulatory terms that would apply to boilers. Facilities such as cement kilns are fully regulated under RCRA for storage and treatment. They are also subject to stringent air emission standards under the CAA and HWC MACT rules. Even though the ECF rule would allow the exclusion of certain wastes from the definition of solid waste, those secondary materials would remain ideal for use as fuel in fully regulated facilities.

We believe that a fully regulated facility such as a cement kiln has the ability to recover the energy from these wastes more effectively than any water-tube boiler (especially since they are already performing this function). More importantly, the environmental benefits of burning these materials in cement kilns as described herein are significant, while burning them in boilers will cause significant environmental and economic harm. The crux of EPA's justification for allowing waste to be burned nearly unregulated in water-tube boilers is based upon a 1980's report that indicated that, theoretically, CO can be used to assure that DRE in incinerators will meet or exceed 99.99%. Unfortunately for other industrial furnaces, including cement kilns, no such exact laboratory test was conducted or similar report prepared. However, what these other devices (especially cement kilns) have is an abundance of test data and operational history that shows their overwhelming ability to not only meeting the DRE requirements, but also the ability to control emissions of all other constituents of concern. Thus, based only on DRE, there is no reason why a cement kiln should not be allowed to accept the ECF wastes while still allowing generators to claim the proposed exclusion.

What is even more important, however, is the fact that cement kilns must meet the regulatory limits of both RCRA and HWC MACT. As EPA is aware, these regulations place strict limits on numerous operating parameters for kilns to assure that emissions are well within the standards imposed. Further, each facility must test to prove that these emissions are within the standards, while simultaneously setting operating parameter limits. Compared to the proposed requirements for ECF boilers, the number of operating limits at HWC cement kilns is an order of magnitude higher. Thus, cement kilns will control emissions from the burning of ECF to a far greater extent than ECF boilers.

Further, cement kilns are subject to the strict scrutiny of permitting. The limits established under the HWC MACT regulations are placed in CAA Title V permits. For kilns, these permits allow the regulators and the public the opportunity to review and comment on a facility's environmental performance. As currently written, the ECF proposed rule establishes a few requirements, but places none of those requirements in permits allowing for public comment and routine oversight by regulatory agencies. For cement kilns and other industrial furnaces, the opposite is true.

In addition, storage and handling of hazardous wastes at cement kilns occurs in RCRA-regulated tanks and handling systems. Unlike unregulated ECF, the storage and handling at cement kilns is subject to considerable regulatory oversight and control, even after ceasing operations. Facilities are subject to the requirements for financial assurance and closure, as well as subject to corrective action in the event of a release of hazardous constituents to the environment. Certainly the acceptance of ECF at a regulated cement kiln would afford significantly more protection to human health and the environment than at a facility subject only to the proposed ECF storage regulations. Therefore, if EPA promulgates an ECF rule, we believe that EPA should allow these wastes to be used as fuel at fully-regulated HWC cement kilns while still granting generators the proposed exclusion.

Attachment A

Evaluation of Emission Increases Due to ECF

ACC Survey Data on Potential ECF Waste Streams								Equivalent Comp. Fuel Emissions				
Waste Stream ID	Approximate Annual Quantities (lbs)	Btu Value (Btu/lb)	Annual Fuel Value (MMBtu/yr)	Constituent	Const. Conc.[1]	Annual Quantity of Const. in ECF (lbs)	Annual Const. Emissions (lbs)[2]	Equivalent Annual Comp. Fuel (lbs)[3]	Constituent Limit (mg/kg)[4]	Equiv. Annual Qty of Const. in Comp. Fuel (lbs)[3]	Equivalent Annual Const. Emissions (lbs)[1]	Factor Increase in ECF Emissions
B-01-11	16,005,000	11,000	176,055	MEK	3%	480,150	48	17,605,500	39	687	0.069	699
				Isobutyl alcohol	15%	2,400,750	240		39	687	0.069	3,497
B-01-12	1,850,000	11,200	20,720	Benzene	4%	74,000	7.4	2,072,000	4,100	8,495	0.85	9
B-01-13	15,960,000	11,200	178,752	Benzene	4%	638,400	64	17,875,200	4,100	73,288	7.3	9
				Acetophenone	15%	2,394,000	239		2,400	42,900	4.3	56
B-02-14	118,037,400	11,000	1,298,411	Isobutyl alcohol	15%	17,705,610	1,771	129,841,140	39	5,064	0.51	3,497
				MEK	3%	3,541,122	354		39	5,064	0.51	699
D-02-11	2,974,760	10,000	29,748	MEK	0.8%	23,798	2.4	2,974,760	39	116	0.012	205
				Isobutyl alcohol	0.25%	7,437	0.74		39	116	0.012	64
D-03-14	1,200,000	19,500	23,400	Toluene	40%	480,000	48	2,340,000	36,000	84,240	8.4	6
D-04-12	6,000,000	19,500	117,000	Toluene	50%	3,000,000	300	11,700,000	36,000	421,200	42	7
D-04-13	1,000,000	19,500	19,500	Toluene	50%	500,000	50	1,950,000	36,000	70,200	7.0	7
D-05-11	56,176,000	12,000	674,112	MEK	2%	1,123,520	112	67,411,200	39	2,629	0.26	427
				Isobutyl alcohol	5%	2,808,800	281		39	2,629	0.26	1,068
F-01-16	50,000	13,000	650	Isobutyl alcohol	0.022%	11	0.001	65,000	39	3	0.00025	4
J-05-11	1,900,000	14,000	26,600	Toluene	10%	190,000	19	2,660,000	36,000	95,760	9.6	2
				Isobutyl alcohol	5%	95,000	9.5		39	104	0.010	916
K-04-12	4,700,000	8,000	37,600	Acrolein	0.05%	2,350	0.23	3,760,000	39	147	0.015	16
L-02-12	3,000,000	10,000	30,000	Toluene	70%	2,100,000	210	3,000,000	36,000	108,000	11	19
L-06-11	4,700,000	15,000	70,500	MEK	35%	1,645,000	164	7,050,000	39	275	0.027	5,983
L-06-18	36,000	12,500	450	MEK	90%	32,400	3.2	45,000	39	2	0.00018	18,462
M-03-12	1,100,000	18,000	19,800	Toluene	100%	1,100,000	110	1,980,000	36,000	71,280	7.1	15
M-03-13	570,000	18,000	10,260	Toluene	100%	570,000	57	1,026,000	36,000	36,936	3.7	15
M-03-14	550,000	18,000	9,900	Toluene	100%	550,000	55	990,000	36,000	35,640	3.6	15
M-03-15	1,720,000	18,000	30,960	Toluene	50%	860,000	86	3,096,000	36,000	111,456	11	8
M-03-16	1,020,000	17,000	17,340	Toluene	80%	816,000	82	1,734,000	36,000	62,424	6.2	13
				Isobutyl alcohol	10%	102,000	10		39	68	0.0068	1,508

[1] Based on "Limit that Could be Met" if available or "Waste Description (primary constituents)" fields (Memo to Robert Springer and Matt Hale from Robert Elam, ACC (EPA-HQ-RCRA-2005-0017-003[1])

[2] 99.99% Assumed DRE

[3] 10,000 Btu/lb (basis for comparable fuel concentration limits, Table 1 to 40 CFR 261.38)

[4] Concentration Limits from Table 1 to 40 CFR 261.38

Expansion of RCRA Comparable Fuel Exclusion; Proposed Rule
Evaluation of Emission Increase (ECF Constituent Concentration, 100%) July 23, 2007

Constituent	Btu Value (Btu/lb)[1]	ECF Constituent Conc.	ECF Constituent Emissions (lbs/MMBtu)[2]	Comparable Fuel Constituent Conc. Limit (mg/kg)[3]	Comparable Fuel Constituent Emissions (lbs)[2,4]	Factor Increase in ECF Emissions
Benzene	18,061	100%	5.5E-03	4,100	4.1E-05	135
Toluene	18,279	100%	5.5E-03	36,000	3.6E-04	15
Acetophenone	14,872	100%	6.7E-03	2,400	2.4E-05	280
Acrolein	12,500	100%	8.0E-03	39	3.9E-07	20,513
Ally alcohol	13,746	100%	7.3E-03	30	3.0E-07	24,249
Bis(2-ethylhexyl)phthalate [Di-2-ethylhexyl phthalate]	15,130	100%	6.6E-03	2,400	2.4E-05	275
Butyl benzyl phthalate	14,550	100%	6.9E-03	2,400	2.4E-05	286
o-Cresol [2-Methyl phenol]	15,013	100%	6.7E-03	2,400	2.4E-05	278
m-Cresol [3-Methyl phenol]	14,752	100%	6.8E-03	2,400	2.4E-05	282
p-Cresol [4-Methyl phenol]	15,025	100%	6.7E-03	2,400	2.4E-05	277
Di-n-butyl phthalate	13,300	100%	7.5E-03	2,400	2.4E-05	313
Diethyl phthalate	10,920	100%	9.2E-03	2,400	2.4E-05	382
2,4-Dimethylphenol	15,330	100%	6.5E-03	2,400	2.4E-05	272
Dimethyl phthalate	10,428	100%	9.6E-03	2,400	2.4E-05	400
Di-n-octyl phthalate	15,258	100%	6.6E-03	2,400	2.4E-05	273
Endothall	7,500	100%	1.3E-02	100	1.0E-06	13,333
Ethyl methacrylate	12,670	100%	7.9E-03	39	3.9E-07	20,238
2-Ethoxyethanol [Ethylene glycol monoethyl ether]	11,877	100%	8.4E-03	100	1.0E-06	8,420
Isobutyl alcohol	15,498	100%	6.5E-03	396	4.0E-06	1,629
Isosafrole	13,710	100%	7.3E-03	2,400	2.4E-05	304
Methyl ethyl ketone [2-Butanone]	13,480	100%	7.4E-03	39	3.9E-07	19,022
Methyl methacrylate	11,400	100%	8.8E-03	39	3.9E-07	22,492
1,4-Naphthoquinone	12,607	100%	7.9E-03	2,400	2.4E-05	331
Phenol	13,973	100%	7.2E-03	2,400	2.4E-05	298
Propargyl alcohol [2-Propyn- 1 -ol]	11,551	100%	8.7E-03	30	3.0E-07	28,858
Safrole	13,824	100%	7.2E-03	2,400	2.4E-05	301

[1] Draft Technical Support Document for the Expansion of the Comparable Fuels Exclusion, USEPA, May 2007
[2] 99.99% Assumed DRE
[3] Concentration Limits from Table 1 to 40 CFR 261.38
[4] 10,000 Btu/lb (basis for comparable fuel concentration limits, Table 1 to 40 CFR 261.38)