I. Overview

As detailed below, the Institute of Clean Air Companies, (ICAC), is providing comments on EPA's proposed amendments to the National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters (the "Boiler MACT") relevant to measurement technologies for measuring hydrogen chloride (HCl) at the limits proposed and is also providing information regarding the costs of these technologies, including costs associated with ongoing maintenance/replacement. In addition, ICAC is providing comments on the use of SO_2 as a surrogate for HCl and the importance of considering the diversity of solid fuel feedstocks when setting emission limits.

ICAC makes the following recommendations:

- While there may be advanced, cost-effective emissions measurement technologies available that can measure at the limits proposed by EPA, ICAC recommends that proposed regulatory requirements also include the specification of these technologies as acceptable reference test methods and performance specifications for CEM systems.
- ICAC agrees with EPA that surrogates are acceptable for use as a substitute for HCl—provided that a scrubber is installed at the facility. It should also be noted that control technologies, such as trona and hydrated lime injection into the flue gas remove both HCl and SO_2.
- ICAC recommends that EPA considers variances in the origin of solid fuel feedstocks based on a variety of factors, including source, season and geography, which will directly impact levels of HCl. ICAC recognizes that subcategorization may not be part of the remand, but the economics, technologies and emissions profiles are greatly impacted by these variations and this fact should be considered in order to not hinder the use of biomass or construction of new biomass facilities in the future.

II. Measurement Technologies and Compliance Test Methodology

Measurement technologies to meet the proposed limits exist and proposed regulatory requirements should include them as acceptable reference test methods and performance specifications for continuous emissions monitoring.

The measurement of HCl from boilers and industrial furnaces may be achieved directly by several different technologies and techniques. Method 26, an isokinetic method, and its single point location sister methodology, Method 26A, are EPA's favored reference methods with the most previous method development prior to the advent of more advanced continuous measurement technologies. These manual methods have been improved by various organizations to push the detection limits for HCl to lower level of detection, as shown in Figure 1 below from a test series of low-level formaldehyde on natural gas-fired combustion turbines (NGT). The test series illustrates that advanced instrumental techniques are capable of providing the greater sensitivity needed to quantify emissions at the proposed levels. Formaldehyde and HCl are very close spectrally in the near-infrared region of the electromagnetic spectrum, therefore, the same instrument that measures formaldehyde may also be used to measure HCl and the detection limits will be comparable.

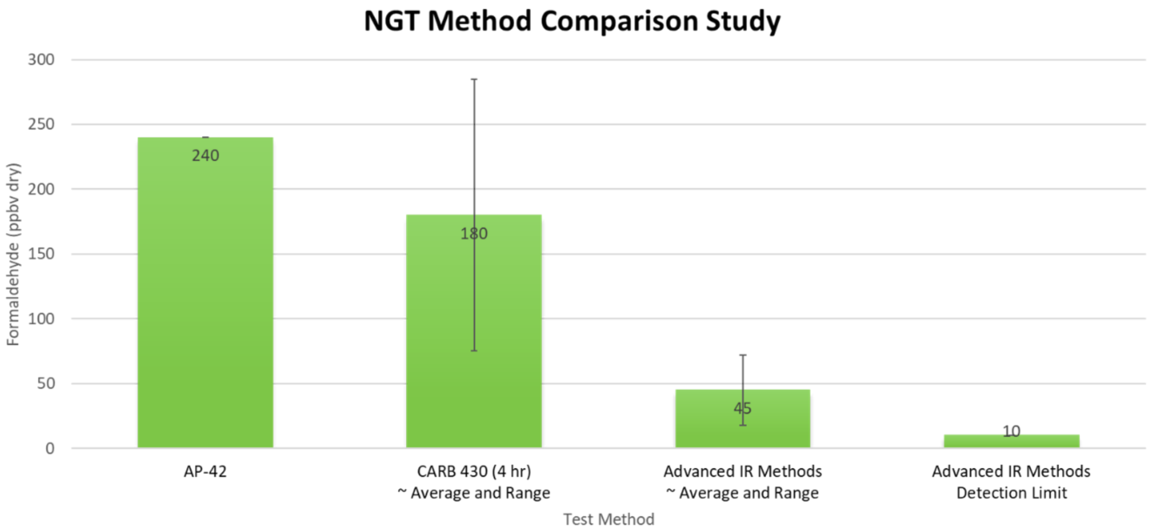

Figure 1. Results from a 2019 study of flue feeds for natural gas turbines (NGT) comparing low-level formaldehyde detection by method. Source: Montrose Environmental Group (Presentation at CIBO Conference 2019)

However, with the introduction of other more advanced technologies, such as Fourier Transform Infrared Spectrometry (FTIR), and laser-based devices, such as tunable diode laser absorption spectrometry (TDLAS), these limits have been pushed even lower. Over the last five years, the development of more advanced technologies has enabled the detection limits to now measure HCl in the range of part per billion by volume (<10 ppbv) HCl, and even lower to part per trillion with proton transfer coupled gas chromatography devices - with many meeting EPA Method 18 or EPA Method 301 validation requirements. These advanced technologies include optically enhanced FTIR, more advanced laser devices including external etalon laser devices, and cavity ringdown spectrometers.

These more advanced technologies and comparable competing technologies are now commercially available from a number of vendors, meaning no technology vendor will have a monopoly on a specific technology capable of meeting the lower proposed limits for HCl. These systems are regularly used for continuous emission monitoring (CEM) systems and are passing their required Performance Specifications, including PS15 and PS18.[1] Additionally, there are no known technological obstacles to meeting the lower limits for any anticipated regulatory changes. However, proposed regulatory requirements must include these technologies as acceptable reference test methods and performance specifications for CEM systems or be a technology neutral specification where any technology meeting the PS requirements is acceptable.

III. Monitoring Costs

Although it is possible to monitor at the levels that EPA has proposed, there will be a significantly increased cost associated with such monitoring.

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[1] Abstracts and presentations on CEMS and HCl monitoring, EUEC 2015. https://euec.com/uncategorized/cems-hcl-monitoring/

ICAC estimates that an HCl analyzer (with umbilical enclosure, reference gases, etc.) would cost approximately US$200,000 - 250,000. In addition, a low-end cost estimate for a scrubber would be approximately US$100,000-$150,000, with annual maintenance and service costs of approximately US$40,000. Additional operating consumable costs would range from approximately US$15,000-$30,000. An FTIR for HCl in CEMS could cost substantially more annually, including integration, than today's estimated total system cost.

ICAC understands that this information may not be relevant in the narrow remand context EPA is considering, however, ICAC believes that it is generally relevant information that EPA should consider.

IV. Use of Surrogates

The use of SO_2 as a surrogate for HCl is acceptable when a facility has a scrubber installed, however, directly measuring the pollutant of interest is scientifically the best practice.

EPA has accepted the use of surrogates for HCl. The surrogate of choice is SO_2, as the reasoning is that if the acid gas SO_2 is removed by a control device, then the control device is also removing HCl by using technologies such as wet/dry scrubbers or the use of dry sorbents. There is also an assumption that SO_2 analyzers are less costly than the direct measurement of HCl by continuous type analyzers and with data points on the order of seconds. However, any assumption about the cost of SO_2 systems is not universal when you factor in the other compounds that may be measured in addition to the target compound, HCl. This premise does not stand when a facility has a Part 75 CEM system for SO_2 already installed. However, most of these boilers and furnaces do not have Part 75 CEM systems already in place.

Additionally, the acceptance of SO_2 as a surrogate for HCl is premised on the assumption that SO_2 and HCl are reduced to concentrations below detection by the control devices. However, there is evidence in the literature and from many scientists who have performed hundreds of compliance tests in the field that this is not always a safe assumption and "by-passing or short circuiting" does occur. Acid gas control applications are affected by a "decrease in pH or specific gravity", which results in a lower driving force (i.e. a decrease in ability to absorb). This is more important for some acid gases than others because of differing absorption coefficients, e.g., it is more important for SO_2 control than HCl control.

Therefore, ICAC believes:

1. Direct measurement analyzers for HCl are readily and widely available, very sensitive, and likely more accurate than SO_2 analyzers due to the technology utilized.
2. Direct measurement HCl analyzers are cost effective and some can add the additional benefits of measuring SO_2, NOx, CO, H2O, HF, CO2, CH4 and other compounds of interest. They are also important for process control and optimization, depending on measurement technology selection.

V. Impacts of Biomass Variations

As detailed more fully below in the comments, the amendments to the "Boiler MACT" fail to fully consider the differences within the solid fuel category with respect to the diversity of biomass. The differences in solid fuels and the HCl emissions profile associated with each indicate that it is appropriate for the EPA to establish a new subcategory for certain units firing biomass, and perhaps multiple subcategories.

In response to these remands, this current action proposes to amend the HCl emission limits for new boilers and process heaters utilizing solid fuels. The proposed HCl emissions limits for new solid fuel units unreasonably burdens biomass units without full consideration of the differences between boiler and process heaters using coal and those using biomass sources. ICAC believes that the Proposed Rule fails to identify and evaluate the consequences of the proposed change to the HCl emission limits for new boilers and process heaters utilizing solid fuels.

Therefore, ICAC offers these comments specifically with respect to the Agency's proposal to revise the HCl emission limits for new boilers and process heaters utilizing solid fuels.

1. There is Agency precedent acknowledging subcategorization predicated on fuel type.

EPA has previously subcategorized sources by fuel type when there was sufficient distinction in the resulting emissions profiles. The MATS rule (77 FED. Reg. 9304 (Feb. 16, 2012)), the CISWI rule (76 FED. Reg. 15608 (March 21, 2011 and 76 FED. Reg. 15704 (May 18, 2011)) and the eastern bituminous coal refuse subcategorization rule associated with MATS (85 FED. Reg. 20838 (April 15, 2020)) all based the unit emissions profile on the fuel introduced to the primary unit. We believe that in the Boiler MACT it is appropriate for EPA to evaluate and establish emissions limits for existing and new sources combusting or gasifying solid fuel biomass as a unique subcategory. Furthermore, it may be appropriate to differentiate between woody biomass and biomass originating from animal waste.

2. Unit designs are distinct for the captive biomass fuel sources they serve.

Biomass fuel is inherently diverse and dissimilar to other solid fuels used in boilers and gasifiers. Hard and soft coals have very typical combustion parameters and characteristics. Waste coal sources throughout the bituminous region of the U.S. have been acknowledged to be distinctly dissimilar to bituminous or subbituminous coals. Furthermore, the emissions resulting from the combustion of waste coal are distinct from other coal sources. If EPA has determined that waste coal is a subcategory to coal, then biomass must be substantively dissimilar to coal and the resulting emissions profile is dissimilar, as well.

Solid fuel biomass is utilized in both combustion and gasification processes. Gasification is the process that converts the carbon into a useful product gas that is used as a source fuel. Gasification involves reactions in an oxygen-deficient environment. Combustion involves high-temperature conversion of the source fuel in excess air into carbon dioxide and water. The differences between the conversion processes of gasification and combustion are many. The consideration for the design of either a combustion or gasification process uniquely consider the source fuel to be utilized.

Sources of solid biomass fuel suffer from fuel variability as a matter of origin. Most distinctly, woody biomass fuel composition is subject to seasonal, species-related and geographic variation. Biomass accumulated for renewable energy generation in coastal regions has greatly different chloride concentration than biomass accumulated in higher elevation from forestry management or fire protection activities. Additionally, waste litters can vary in chloride concentration as a result of the diet fed to the originating animal. Attempting to assign a standard associated with a single "solid fuel" source category is inappropriate.

As such, a singular “solid fuel” group for industrial boilers cannot adequately address the variation between coal fuel sources and the numerous biomass fuels.

3. **The chlorine content in biomass varies by source, season, and geography.**

Sources utilizing highly diverse fuels require special consideration in design and lack broad fuel flexibility. There is inherent fuel variability associated with the eastern bituminous coal refuse (EBCR or “waste coal”) sites, which is a close analogy to biomass. The waste coal facilities were developed and sited with the intent of serving a captive source fuel; that is each waste coal FBC was sited in proximity to several unique piles of stranded waste coal. The variability in these waste coal varied not only from site to site but with the host coal piles. Therefore, the facility designs were intended to address specific fuel piles. Facilities utilizing EBCR had a fuel design specification where broad heat contents, sulfur contents, and chloride concentrations persisted. This is also true with source utilizing biomass fuels.

Each biomass unit is designed to serve a particular set of source fuels, economically established based on geography. Whether woody biomass or poultry or swine waste, a facility combustor and/or gasifier design is predicated on the ready availability of the fuel. Unlike a coal source fuel, where supply chains are established to support fuel switching and or geographical diversification of sources, biomass is captive to either the swine yards, layer and broiler houses or forestry activities within an area of economical transport. In developing the Boiler MACT rule, EPA did not evaluate the extremely broad definition of biomass and its impact on combustion, gasification, emissions and types of boiler/combustors used for biomass, however, these are important considerations as EPA works toward finalizing its proposed revisions.

EPA defines “biomass” or “bio-based” as the following:

> *“…solid fuel means any biomass-based solid fuel that is not a solid waste. This includes, but is not limited to, wood residue; wood products (e.g., trees, tree stumps, tree limbs, bark, lumber, sawdust, sander dust, chips, scraps, slabs, millings, and shavings); animal manure, including litter and other bedding materials; vegetative agricultural and silvicultural materials, such as logging residues (slash), nut and grain hulls and chaff (e.g., almond, walnut, peanut, rice, and wheat), bagasse, orchard pruning’s, corn stalks, coffee bean hulls and grounds…”*[2]

EPA’s bundling of all biomass into one category did not recognize the system design, different combustion or gasification systems selection, air pollution control, and emissions based on the fuel used. Biomass combustion technology is dictated by the source fuel. For example, chicken manure from Maryland may will not burn correctly in a combustion system designed to burn chicken manure from North Carolina. These materials are difficult to burn efficiently due to the fuel’s inherent physical and chemical properties - one source may require an oxidizing combustion and the other a reducing combustion condition resulting in different emissions. Furthermore, the manure combustion systems are dramatically different to wood chip burners and require a different type of air emission controls.

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[2] National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters, 76 Fed. Reg. 80598 (proposed December 23, 2011) (to be codified as 40 CFR Part 63).

Biomass fuel may be sourced from different sources and will vary over time, weather conditions and economics. As a result, the concentrations of chloride in the biomass fuel will likewise vary in terms of HCl emissions. The "best" performing unit used in EPA's analysis to set the new boiler HCl limit did not have an acid gas control or FGD system and was based on a one-time test and, therefore, may have different capture parameters than other combustion systems. The HCl emissions were directly related to the chloride content of the biomass that was burned. Published reports state that a percentage of the chlorides are captured in the fly-ash/boiler. The type of combustor (i.e. bubbling bed vs. a stoker) will have different parameters and varying abilities to capture the chlorides in the ash. Table 1 below is compiled to generally illustrate the Existing and New Source firing Solid Fuels, which underscores the concern, and represents the basis for potential commentary to EPA.

		Solid Fuels		
		Current - Existing Source	Proposed - Existing Source	Proposed - New Source
	Units	HCl	HCl	HCl
Limit	lb/MMBtu	2.20E-02	2.00E-02	0.0003
F_d	dscf/MMBtu	9240	9240	9240
Fuel burn rate	tons/hour	5	5	5
Fuel burn rate	lbs/hr	10000	10000	10000
HHV	MMBtu/lb	6000	6001	6000
GHI	MMBtu/hr	60	60.01	60
Q (flue gas flow)	dscf/hr	554,400	554,492	554,400
Q (flue gas flow)	dscf/min	9,240	9,240	9,240
HCl mass flow	lb/hr	1.32	1.20	0.02
HCl molar flow	mol/hr	16.44	14.94	0.22
HCl vol. flow	ppm_{vd}	25.16	22.88	0.34

Table 1. Comparison of current and proposed limits for Existing and New Sources firing solid fuels. Source: ICAC

Figure 2 below shows the significant variations in the heating values of various biomass products. These heating values help drive the combustion system, stoker, gasifier, bubbling bed or circulating bed technology, each as their own emission basis.

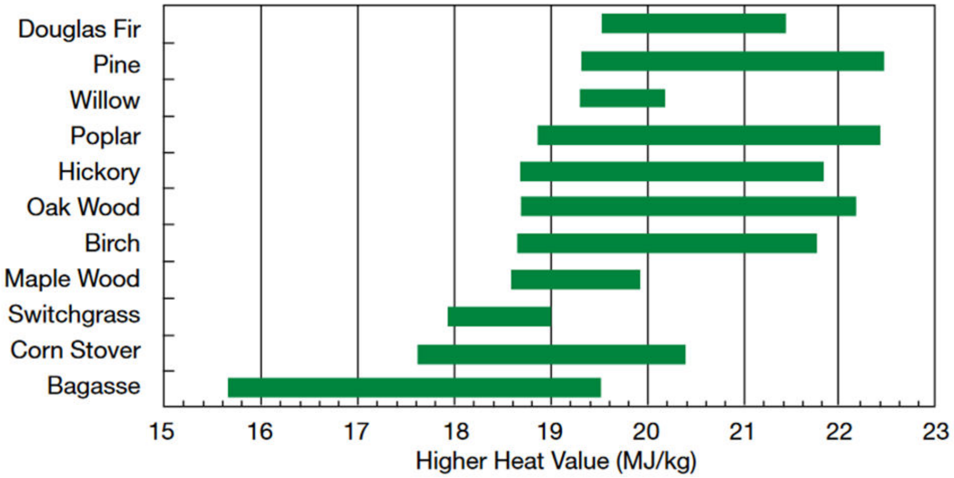

Figure 2. Heat content of various biomass fuels. Source: Pennsylvania State University [3]

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[3] Ciolkosz, D. (2010). *Characteristics of Biomass as a Heating Fuel.* Pennsylvania State University. https://extension.psu.edu/characteristics-of-biomass-as-a-heating-fuel

Biomass fuel may be obtained from different sources and will *naturally* vary over time, according to weather conditions and be driven by economics. As a result, the concentrations of chloride in biomass fuel sourced for an individual unit will likewise vary and will drive variation in HCl emissions. EPA's method of using the UPL for the New Boiler rule may not capture the seasonal variation in chlorides and the fuel used at the "best" performing unit does not represent the range of chlorides in biomass.
The following literature provides several reports that highlight the variation of chlorides in different types of biomass.

- The report "*Release of Chlorine from Biomass at Pyrolysis and Gasification Conditions*" (E. Björkman and B. Strömberg) states that biomass chlorine content can vary between <100 and 7000 mg/kg, and the amount is dependent on closeness of the sea, fertilizers and leaching of the soil by the rain.
- EPA's memo "*Contaminant Concentrations in Traditional Fuels: Tables for Comparison*" [(Nov. 29, 2011) https://www.epa.gov/sites/production/files/2016-01/documents/nhsm_cont_tf.pdf] shows the OAQPS Databases that the chloride content of untreated wood and biomass, including bark, bagasse, hog fuel, and agricultural plant residues, ranges from non-detect levels to 5,400 ppm on a dry basis, with an average of 259 ppm. The memo also states that the literature search shows a range of non-detects to 2,600 ppm.
- In August 2013, the University of Wisconsin- Madison published a report *"Economic and Environmental Impact of Biomass Types for Bioenergy Power Plants Final"* (https://www.focusonenergy.com/sites/default/files/research/1010RungeFinalReportx.pdf)
    - Three quotes from this report that are significant in defining biomass emissions are:
        1. "Biomass combustion with Cl-laden material can lead to hydrogen chloride (HCl) formation. The majority of the chlorine content is retained in the ash, but higher levels of chlorine content in herbaceous biomass such as switchgrass and miscanthus can lead to increased hydrogen chloride emissions."
        2. "The three herbaceous samples with values above 3000 ppm (d.b.) are ditch grass samples that were removed from the side of highway 151 in Dane County, Wisconsin in October. It appears that road salt operations in the winter for de-icing could have led to increased levels of chlorine in the ditch grass, and that precipitation over the spring, summer, and fall did not remove enough salt to reduce chlorine content in the grass".
        3. "Paper mill waste was the only residual fuel that had a low chlorine level, below 1000 ppm (d.b.), indicating it doesn't have a need for emission control technology. The DDGs had moderate levels of chlorine in the 1000-3000 ppm (d.b.) range and may need hydrogen chloride emissions abatement equipment and a need to periodically clean boiler surfaces. The manure briquettes also showed moderate levels of chlorine, but the manure & sawdust sample showed very high levels of chlorine indicating that either the fuel needs to be controlled in pre-processing, or more advanced emission control equipment may be necessary".
- A report on Polish biomass technology "*Chloride corrosion in biomass-fired boilers – Fe-O-Cl system thermodynamic analysis*" (Robert Kaczmarczyk and Agata Mlonka-Mędrala AGH University of Science and Technology, Faculty of Energy and Fuels, 30 Mickiewicza St., 30059 Krakow, Poland (https://www.e3s-conferences.org/articles/e3sconf/pdf/2016/05/e3sconf_seed2016_00060.pdf)) states the approximate HCl flue gas composition in biomass firing units to range from 25 to 1,000 ppm.
- The 1999 article published in the Journal of Geophysical Research, "*Global chlorine emissions from biomass burning: Reactive Chlorine Emissions Inventory*" [J. Loberr, W. Keene, J Logan and

R. Yevich (https://agupubs.onlinelibrary.wiley.com/doi/pdf/10.1029/1998JD100077)] states "Enhanced atmospheric deposition of sea-salt-derived Cl leads to higher concentrations of Cl in foliage, bark, and litter (but not wood) of coastal forests relative to those inland [McKenzie et al., 1996]. In this study, Cl concentrations decreased roughly exponentially with distance inland; most of the decrease occurred within the first few kilometers and about 90% within 60 km. Available information is limited and precludes a detailed evaluation of the associated impact on Cl emissions from biomass burning".

- This report showed US biomass ranged from 9 to 6,800 mg Cl/kg^{-1}.
- The two following tables were extracted from this report and provide and the details of this study.

Table 4. Chlorine Content of Biomass Fuels and Associated Burning Categories

Cl content	N	Location	Biomass/Ecosystem	Reference
Savanna: SVH				
1260	5	South Africa	grass	*Andreae et al.* [1996]
855	6	Zambia	grass	*McKenzie et al.* [1996]
490	3	Zambia	litter;	*McKenzie et al.* [1996]
830	3	Zambia	dicots	*McKenzie et al.* [1996]
539	1	Venezuela	Trachypogon grass	D. B. Harper (unpublished)
3025	1	Africa	undefined savanna grass	D. B. Harper (unpublished)
1913	1	Unspecified	Sorghum intrans grass	D. B. Harper (unpublished)
1035	1	Venezuela	Calobozo grass	D. B. Harper (unpublished)
1900	1	Cote d'Ivoire, Africa	Hyparrhenia grass	D. B. Harper (unpublished)
888	1	Cymbia, Africa	Hyparrhenia grass	D. B. Harper (unpublished)
Agro-Industrial and Dung Burning: CMB				
1820	13	Rio Grand Valley	avocado, grapefruit, orange, and mango leaves	*Cooper and Gordon* [1950]
1200	5	Texas	citrus leaves (aboveground) grown	*Cooper et al.* [1952]
9000	3	Southern California	citrus leaves	*Harding et al.* [1956]
657	2	Southern California	grapefruit (leaves)	*Pearson et al.* [1957]
6911	26	Victoria, Australia	Sultana vines from irrigated fields	*Woodham* [1956]
4360	1	India	cow dung	D. B. Harper (unpublished)
Agricultural Fuels: BIF				
4012	1	Unspecified	cotton	*Ergle and Eaton* [1949]
5290	1	Riverside, CA	Rhodes grass	*Gauch and Wadleigh* [1951]
3124	1	Riverside, CA	Dallis grass	*Gauch and Wadleigh* [1951]
4200	13	Unspecified	mixed crops	*Cram* [1976]
2741	3	Northern Japan	rice straw	*Saito et al.* [1994]
6800	1	Texas	switchgrass - leaves and grass from fertilized field	*Agblevor and Besler* [1996]
1333	1	Manitoba, Canada	wheat straw	*Amiro et al.* [1996]
9422	1	Germany	hay	D. B. Harper (unpublished)
5605	1	Indonesia	rice straw	D. B. Harper (unpublished)
7575	1	South Africa	sugar cane	D.B. Harper (unpublished)
Wood - Temperate (except Australia): WDF, FOR				
12	4	Maine	red maple, white birch, white pine, and red spruce	*Young and Guinn* [1966]
28	4	Oklahoma (U.S.)	eastern cottonwood, white oak, basswood, white ash	*Osterhaus et al.* [1975]
11	18	Unspecified (U.S.)	white oak	*Slocum et al.* [1978]
50	7	Unspecified (U.S.)	white oak, basswood, hard maple, southern pine, Douglas fir, redwood western red cedar,	*Cutter et al.* [1980]; *Young and Guinn* [1966]
90	8	New Jersey	pitch pine	*Hall and Naumann* [1984]
50	1	West Canada	Lodgepole-Jack pine (without polluted samples)	*Legge et al.* [1984]
2.4	60	Ohio	Tulip trees; plantation grown	*McClenahen et al* [1989]
37	3	Washington State	Douglas fir	*Reinhardt and Ward* [1995]
123	4	North Carolina	Bald cypress; Cl intrusion not included	*Yanosky et al.* [1995]
9	3	Oregon	Douglas fir;	*McKenzie et al.* [1996]
185	130	North Ireland, Scotland, China	130 different species	*Watling and Harper* [1998]
Bark and Phloem - Temperate (not considered)				
58	1	Oklahoma	eastern cottonwood bark	*Osterhaus et al.* [1975]
170	8	New Jersey	pitch pine; bark and phloem	*Hall and Newmann* [1984]
37	6	Oregon	douglas fir	*McKenzie et al.* [1996]

Table 4. (continued)

Cl Content	N	Location	Biomass/Ecosystem	Reference
			Leaves - Temperate Forest: FOR	
2428	45	Oklahoma	leaves from six species impacted by oil-field drainage; data excluded from category statistics	*Harper* [1946]
373	3	Massachusetts	oak, hickory, and maple leaves and twigs; only untreated trees included	*Holmes* [1961]
567	3	Massachusetts	sugar maple; data for trees adjacent to salted roads were excluded	*Baker* [1965]
592	3	Massachusetts	sugar maple; data for trees adjacent to salted roads were excluded	*Button* [1965]
760	5	Massachusetts	sugar maple; data for trees adjacent to salted roads were excluded	*Holmes and Baker* [1966]
9	3	Washington State	slash - Douglas fir	*Reinhardt and Ward* [1995]
296	18	Oregon	Douglas fir; author reports multiple samples at six sites	*McKenzie et al.* [1996]
259	1	Germany	pine needles	D. B. Harper (unpublished)
			Litter/Duff - Temperate Forest: FOR	
121	4	Washington State	douglas fir	*Reinhardt and Ward* [1995]
127	18	Oregon	douglas fir	*McKenzie et al.* [1996]
139	1	Unspecified	top soil layer; deciduous forest	D. B. Harper (unpublished)
			Charcoal: WDF	
12	18	Unspecified (U.S.)	commercial charcoal from white oak	*Slocum et al.* [1978]
50	9	Unspecified (U.S.)	charcoal (from various species)	*Cutter et al.* [1980]
			Wood (Eucalypt) (applied only to Australia): FOR	
606	20	Australia, Tasmania, North Ireland, Scotland	20 different species	*Watling and Harper* [1998]
			Wood - Tropical/Subtropical (except Australia): WDF, SBS, DEF	
498	3	Venezuela	3 different species	*Osterhaus et al.* [1975]
105	2	Brazil	upland evergreen forest	*McKenzie et al.* [1996]
50	1	Zambia	moist savanna	*McKenzie et al.* [1996]
249	48	Cameroon, Borneo, Malaysia	48 different species	*Watling and Harper* [1998]
			Leaves - Tropical/Subtropical Forest: SBS, DEF	
230	3	Brazil	foliage	*McKenzie et al.* [1996]
830	6	Zambia	dicots	*McKenzie et al.* [1996]
1600	3	Zambia	foliage	*McKenzie et al.* [1996]
			Litter - Tropical/Subtropical Forest: SBS, DEF	
83	6	Brazil	multiple samples at two sites	*McKenzie et al.* [1996]
490	3	Zambia	multiple samples at one site	*McKenzie et al.* [1996]
321	1	Philippines	pine needle litter	D. B. Harper (unpublished)
			Grasslands - No Data - Temperate Forest Leaves Used as Proxy: GRS	
			Shrubland, Heath, Tundra Fires- No Data - Temperate Forest Leaves Used as Proxy: SHB	

D. B. Harper (unpublished data, 1998) describes data obtained from biomass samples used by *Lobert et al.* [1991]. Units in the first column are mg Cl kg^{-1} dry fuel.

4. **There is a reliance on previously promulgated state statutes mandating biomass use and there is a fundamental net environmental benefit associated with biomass utilization.**

The "net environmental" benefits associated with biomass utilization should have bearing on the need and meaningfulness of appropriate subcategorization. It was determined that the establishment of a subcategory for EBCR would allow the associated units to continue to achieve the net positive environmental benefits of repurposing coal refuse into energy while maintaining emissions at a protective level. The option of converting coal refuse into electricity was deemed to be a net environmental benefit and a significant cost savings to the taxpayers.[4]

The same consideration should be given to solid fuel boilers utilizing biomass fuels under the Boiler MACT. According to the National Conference of State Legislators, thirty States have established renewable portfolio standards (RPS). RPS and the associated standards play an integral role in efforts to diversify the source of energy generation and reduce overall emissions from electricity generation. Three states - Connecticut, New Mexico and North Carolina - have biomass standards mandating, by enabling statute, a specific amount of biomass in the in the mix of generation sources operating in these states. The new source solid fuel standards in the Boiler MACT would preclude or significantly inhibit the ability of these three States to achieve their RPS goals. While each of these States is at various levels of fulfilling the demand for biomass driven RPS, the new source solid fuel emissions levels will effectively preclude the establishment of new facility development allowing reasonable further progress toward these RPS goals.

Furthermore, several states where land application of poultry litters and swine waste have the potential to negatively impacts estuaries and waste bodies. The gasification and/or combustion or animal waste for energy generation is a sustainable alternative to storage and land application of manure keeping harmful runoff out of our local streams, rivers, and estuaries. Traditional land application of animal waste lead to millions of pounds of nitrogen and tens of thousands of pounds of phosphorous loading to receiving waters. Under newly implemented nutrient cap and trade program, water quality is being enhanced and the broad environment is benefited.

As such, a singular "solid fuel" group for industrial boilers cannot adequately address the variation between coal fuel sources and the numerous biomass fuels and fails to adequately consider the net environmental benefits accrued through the preservation and continuation of the current RPS and nutrient mitigation programs.

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[4] Comments submitted by the Anthracite Region Independent Power Producers Association to EPA on EPA-HQ-OAR-2009-0234 (NESHAP/MATS Action) Proposed Rule: National Emission Standards for Hazardous Air Pollutants from Coal and Oil-Fired Electric Utility Steam Generating Units and Standards of Performance for Fossil-Fuel-Fired Electric Utility, Industrial-Commercial-Institutional, and Small Industrial-Commercial-Institutional Steam Generating Units; Revisions. (2015). http://arippa.org/wp-content/uploads/2018/12/UMACT-MATS-EPA-ARIPPA-Final-Comments-Revisions-2015-4-3.pdf