Department of the Environment

TECHNICAL SUPPORT DOCUMENT

Amendments to COMAR 26.11.09 for Biomass Fuel-Burning Equipment Standards

1-23-14

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Biomass Fuel-Burning Equipment TSD Summary

The following document describes many of the topics that were researched by the Maryland Department of the Environment (the Department) in the development of the regulation amendments that propose criteria pollutant emission limits and optimization standards for biomass fuel-burning equipment. The typical type of equipment that is regulated under these amendments is a boiler, though the regulations could also apply to a process heater or other application. The regulation amendments propose to remove a cumbersome and time consuming analysis and exemption process for solid fuels except coal, that exists in COMAR 26.11.09.04 and establish specific emission limitations for biomass fuels in new regulation COMAR 26.11.09.12.

The proposed regulation "Standards for Biomass Fuel Burning Equipment Greater Than 350,000 Btu/hr Heat Input, COMAR 26.11.09.12," was developed to establish requirements for the combustion of biomass fuel. Biomass materials include wood residue and wood products, as well as animal manure, including litter and other bedding materials and vegetative agricultural and silvicultural materials. The proposed regulations are consistent with federal maximum achievable control technology standards (MACT) for boilers greater than 10mmBTU in the federal regulation for biomass *(See Appendix A),* and also provide additional standards for particulate matter ("PM") and nitrogen oxide ("NOx"). Most significant are the standards and requirements for fuel burning-equipment less than 10 MMBtu/hr heat input based on the Department's technical and economic analysis. The Department reviewed details supplied by many stakeholders to set the regulation standards under a best achievable control technology (BACT) process.

State legislation was enacted in early 2013 mandating that the Maryland Department of the Environment revise the existing regulatory exception process for solid fuel-burning equipment to make it easier for potential sources burning biomass to take advantage of new technologies. (*See Appendix B*) 2013 Md. Laws, Ch. 322 (SB797). This legislation prompted the Department to revise COMAR 26.11.09.04 to address the exception process in-place for small solid fuel-burning equipment. (small = 35 mmBtu in urban areas and 13 mmBtu in rural areas – based on historic attainment areas defined in COMAR 26.11.01.03.) When COMAR 26.11.09 was originally adopted, "solid fuel" could be interpreted to mean coal and clean wood. The existing regulations are part of Maryland's clean air plan (Clean Air Act State Implementation Plan, or SIP) and, as such, are federally enforceable requirements. Exceptions to COMAR 26.11.09.04, the regulation prohibition, could legally be granted, but require an individual owner to conduct expensive, time consuming procedures to model emission variations.

Therefore and in contrast, the new proposed regulations allow for the use of small biomass boilers by replacing the cumbersome prohibition and exception process with specified emission limits, which require the use of PM emission control technology that the Department has determined to be technically feasible for owners to use. Other concurrent revisions and the new regulation COMAR 26.11.09.12 are proposed while eliminating the solid fuel prohibition for biomass. As the legislation intended, the new proposed regulations will facilitate the commissioning of small biomass fuel-burning boilers that utilize current technologies, minimize pollution and protect public health. (*See Appendix C and Appendix D*)

The proposed regulations will ensure that new biomass fueled boilers installed in the state will emit low concentrations of pollutants, which will help reduce the state's burden in meeting federal ozone and fine particle standards and contribute to Maryland's greenhouse gas reduction goals. Maryland currently has 7 facilities with existing wood boilers over 13MMBtu. These units are not affected by the proposed regulations, but they must perform a one time EPA energy assessment as required by EPA regulations. Most of the existing wood boilers take advantage of wood by-products. Under COMAR 26.11.09.12, new biomass boilers that meet federal and Maryland emission limit designs may be installed statewide, with the proper fuel material review. Maryland envisions that new, smaller (less than 10 mmBtu) biomass boilers covered under Maryland's proposed regulation are likely to be installed at universities, hospitals, schools and farms.

Biomass fuel, where readily and cost effectively available as a result of energy crop harvesting, sustainable forestry and poultry litter management practices can be used in fuel-burning equipment as a renewable energy source. Biomass fuel derived from poultry litter management practices may also reduce the amount of phosphorous and nitrogen entering the Chesapeake Bay and its tributaries. Currently, the Bay and its rivers receive too much nitrogen, phosphorus and sediment for the ecosystem to remain healthy. The primary sources of these pollutants are agricultural runoff and discharges, wastewater treatment plant discharges, urban and suburban runoff and septic tank discharges, and air deposition.

For Maryland, utilizing poultry biomass fuel-burning equipment may benefit water quality through better management of excess nutrients resulting in a reduction in the amount of phosphorus and nitrogen entering the Chesapeake Bay and its tributaries. The 2013 legislation encourages the use of small biomass boilers that utilize environmental protections. The Governor's office with support from MEA, DNR and MDA offices actively promote better poultry litter management to reduce nutrients entering the bay. Livestock manure and poultry litter account for about half of the nutrient pollution entering the bay. Poultry litter is especially high in phosphorus. These offices also promote use of wood from forest management as a renewable energy source, which concurs with the 2013 legislation process. (*See Appendix E*)

It is important to note that Maryland Legislature passed a law in 2012 banning arsenic in Maryland chicken feed. (*See Appendix F)* 2012 Md. Laws, Ch. 652 (HB 167). This law became effective January 1, 2013 and is implemented and enforced by the Maryland Department of Agriculture.

Using biomass fuel is an alternative to burning conventional fuels, such as fuel oil. In developing the Boiler MACT, the EPA has spent 20 years collecting data and proposing rules covering boilers, incinerators and other equipment using all types of fuels. For unconventional biomass fuels, a material review (including hazardous air pollutants (HAPs) review) is conducted through the EPA non-hazardous secondary materials (NHSM) legitimacy criteria approval process. The Department's proposed regulations define biomass with the inclusion of the EPA NHSM legitimacy criteria. (*See Appendix G*)

The Department looked at recent existing test results from surrounding states for wood and collected data from industry and looked at pilot test results from poultry applications to set emission rates under COMAR 26.11.09.12. The Department's BACT analysis for biomass boilers was conducted as follows (See Appendix H):

a) Detailed analysis of state biomass standards and performance data was collected from NH, VA, DE, CA, CT, MA, VT, NJ and PA. Analysis of EPA biomass data for the Boiler MACT was reviewed. Performance of existing larger wood biomass boilers in Maryland were reviewed.
b) Stakeholder comments and performance data was provided by the Maryland Wood Energy Coalition, the Biomass Thermal Energy Council and Sustainable Chesapeake. Stakeholder conversations were held with the Maryland Energy Administration and the Department of Natural Resources.
c) Data was collected from national combustion equipment manufacturers and from control equipment manufacturers for performance and cost.
d) Conducted a site visit, organized by Maryland Wood Energy Council, of five facilities utilizing recently installed smaller biomass boilers in PA.
e) Maryland's inspection, permitting and operational experience with technology applications for biomass fuel was also included in the analysis and development of BACT standards.

The EPA Boiler MACT set standards and/or requirements for all size boilers and defined fuel types that constituted biomass. The EPA Boiler MACT standards regulate arsenic and other toxic pollutants by controlling a surrogate pollutant (particulate matter) that is reasonably detectable through stack tests and monitoring equipment.

EPA used MACT and GACT to set standards in existing federal regulations. 40 CFR 63 Subpart DDDDD National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters and 40 CFR Part 63 Subpart JJJJJJ, National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers. See Appendix A and EPA webpage materials for details and clarifications. A quick overview of EPA's MACT development process shows:

a. EPA spent twenty years developing Boiler rules
b. Several hundred thousand boilers were reviewed for all types of fuels including coal, natural gas, fuel oil and biomass
c. MACT – Maximum Achievable Control Technology review:
  i. The MACT reviews technology and economic data to establish feasible and readily available controls for boilers
  ii. Emission standards are set based on the best performing data (top 12% of fuel category), within cost parameters
  iii. Measures, processes, methods, systems, techniques and innovative modifications are used to limit the emissions of HAPs from boilers
d. GACT – Generally Available Control Technology review:
  i. Optimization of boilers and best operating practices are required

e. *EPA MACT & GACT standards regulate arsenic and other hazardous and toxic pollutants*

As noted above, the new proposed regulations will require that small biomass boilers install some form of particulate matter pollution controls. Although the new particulate matter requirements are more restrictive than those contained in the federal rule for small biomass boilers (which require only optimization practices), the existing exception process, which is part of Maryland's SIP and federally enforceable, would have resulted in the same BACT determination. Thus, it will be no more expensive for a facility to meet the new requirements for particulate matter than it would have been had the facility installed a boiler under current MD regulations.

Regarding NOx emissions, the new regulations, which are more restrictive than the federal regulations for smaller units, are needed because they will assist the state in complying with the federal ozone standard. *See* 73 FR 16346, Mar. 27, 2008. Under the new standard, Maryland is the only moderate nonattainment area for ozone on the East Coast. The Department believes that the new regulations are necessary to maintain compliance with the ozone standard. In light of current air quality in Maryland, the Department believes that the federal standard for biomass-fueled boilers can be improved and that stricter state regulations are needed for small units. The NOx emission rates for biomass fuel-burning equipment can be achieved through efficient system design and do not require add-on pollution controls. In addition, owners of small biomass boilers should anticipate an overall economic benefit due to reduced fuel costs over the life time of the equipment.

Therefore, the proposed regulations meet the legislative mandate and provide emission limits on smaller units where EPA has only optimization and maintenance plans. The proposed regulations set environmentally protective emission limits but remove the prohibition on wood and other biomass solid fuels.

Department of the Environment

Fact Sheet

Amendments to COMAR 26.11.09 for Biomass Fuel Burning Equipment Standards

1-7-14

Purpose of the New Regulations/Amendments

The primary purpose of amendments and new regulation are to:

1. Incorporate the definition of biomass into Regulation .01;
2. Establish that the provisions from regulations .04 Prohibitions of Certain New Fuel-Burning Equipment, .06 Control of Particulate Matter, and .07 Control of Sulfur Oxides from Fuel-Burning Equipment do not apply to fuel-burning equipment installed after March 1, 2014 that burns only biomass fuels;
3. Establish new regulation .12 Standards for Biomass Fuel-Burning Equipment Equal to or Greater Than 350,000 Btu/hr which sets NOx and PM standards and requirements for biomass equipment where federal standards are not established; and
4. Amend incorrect references from regulations .09 and .10.

Submission to EPA as Revision to Maryland's SIP (or 111(d) Plan, or Title V Program)

This action will be submitted to the U.S. Environmental Protection Agency (EPA) for approval as part of Maryland's State Implementation Plan.

Background

There is significant potential for and interest in biomass for energy recovery and the Department is taking action to enhance and facilitate the application of renewable and energy efficient technologies and practices by establishing standards and procedures. There are existing federal regulations that apply to some of the same fuel-burning categories that Maryland’s proposed regulation will cover. Where Federal regulations are more stringent than the Maryland regulations, the federal standards apply.

New technologies and environmental initiatives have recently increased the use of wood, and other farming by-products, as a fuel to be burned to provide heat and power. To incorporate this new fuel category of biomass, the Department has proposed a new regulation COMAR 26.11.09.12 and related amendments to other pertinent sections of COMAR 26.11.09 regulations.

Biomass materials include wood residue and wood products; animal manure, including litter and other bedding materials; and vegetative agricultural and silvicultural materials.

Because certain components of biomass based fuel could be considered waste, EPA has spent extensive efforts to define the application of biomass any other 'non-traditional fuels'. The proposed Maryland definition of biomass includes the application of the federal legitimacy criteria procedures when required for determining if a material is classified as a solid waste or not. Non-hazardous secondary materials that have been determined not to be solid waste pursuant to 40 CFR 241.3(b)(1), and based on the legitimacy criteria under 40 CFR 241.3(d)(1) can be used in fuel-burning equipment. This determination has no impact/affect on whether the material will be considered a state solid waste.

Biomass fuel, where readily and cost effectively available as a result of energy crop harvesting, sustainable forestry and poultry litter management practices can be used in fuel-burning equipment for energy recovery while meeting applicable standards. Biomass fuel derived from poultry litter management practices may also reduce the amount of phosphorous and nitrogen entering the Chesapeake Bay and its tributaries.

Maryland produces approximately 500-600 million chickens a year, as a result, it is projected that close to 600-700 million pounds of poultry litter is produced. The industry is one of the state’s most productive forms of agriculture, one of its largest employers, and has seen steady growth with increasing demand for low cost chicken and contributes close to $700 million to the Maryland economy. The application of technology that meets Maximum Achievable Control Technology (MACT)/Generally Available Control Technology (GACT)/Best Available Control Technology (BACT) standards to recover energy from poultry litter and other biomass materials would be useful to utilize renewable fuels and provide broad benefits to the environment.

Federal Maximum Achievable Control Technology (MACT) standards for major sources were finalized on January 31, 2013 under 40 CFR 63 Subpart DDDDD National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters. MACT standards for industrial, commercial and institutional boilers apply to complex, non-homogeneous biomass fuels and equipment differentiated by design and heat input capacity. The MACT standards are for hazardous air pollutants (HAPs). EPA finalized 40 CFR Part 63 Subpart JJJJJJ, National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers on February 1, 2013. GACT standards are applicable to boilers less than 10 MMBtu/hr heat input. Under GACT, optimization and best operating practices are required. The technology developments for different types of boilers and performance results reflected in the MACT standards have a significant impact on the development of NOx standards for different size boilers and on PM standards for small size boilers.

MDE is proposing to amend the existing regulations in COMAR 26.11.09 that would be applicable to biomass fuel-burning equipment. New biomass fuel-burning equipment would be subject to standards based on MACT/GACT /BACT analysis. The amendments and new regulation have been developed to facilitate the permitting and compliance process and also apply standards to size category fuel-burning equipment in the absence of emission standards under MACT/GACT.

Affected Sources

These amendments and new regulation affect new biomass fuel-burning equipment in Maryland.

Requirements

<u>Summary of Federal MACT/GACT Standards, Amendments and Related, Proposed Maryland Standards</u>

Federal MACT –Applicability, Standards and Monitoring Requirements

40 CFR 63 Subpart DDDDD (5D) –Maximum Achievable Control Technology Standards (MACT) for Boilers and Process Heaters –standards for Major Sources
1. HAPS regulated: a) Fuel based emission standards PM and Hg; b) Combustion based emissions of CO.
2. Compliance schedule for source categories: January 31, 2016 for existing sources; and January 31, 2013 or upon startup for new sources.
3. New/existing sources with less than 10 MMBtu/hr category boilers are subject to biennial tune – up requirement.
4. For greater than 10 MMBtu/hr new and existing – emission standards for CO, PM and Hg are applicable.
5. Existing boilers or heaters are subject to work practice standards and energy assessment requirement.
6. Operating and monitoring parameters are based on performance tests and include operating parameters for CO and control devices such as wet scrubber, ESP and bag house with leak detection system.

Federal GACT - 40 CFR Part 63 Subpart JJJJJJ, National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers

1. New biomass boilers greater than 10MMBtu/hr have to meet PM standards and implement a biennial tune-up program.
2. New biomass boilers less than 10 MMBtu/hr are required to implement a biennial tune-up program.
3. Existing biomass boilers are required to implement a biennial tune-up program.
4. Existing biomass boilers greater than 10 MMBtu/hr heat input are required to conduct energy assessment.

Tune-Up Procedures

1. Inspect the flame pattern and burner. Adjust, test, clean, modify and replace as necessary under manufacturer's specifications.

2. Inspect the system controlling the air-to-fuel ratio, calibrate and assure proper operation.

3. Optimize total CO emissions consistent with manufacturer's specification.

4. Measure CO concentrations in the flue gas stream, both before and after the adjustments are made. A portable analyzer may be used.

Energy Assessment

1. Inspection and inventory of energy consuming systems.
2. Analysis of engineering and architectural plans.
3. A list of energy management and conservation measures.
4. Report with recommendations for energy efficiency.
5. List of energy savings.

Startup, Shutdown and Malfunction Requirements

1. Meet work practice standard by following manufacturer recommended procedures to minimize startup and shutdown procedures.
2. For exceedance of standard due to malfunction, records must be kept of malfunction and corrective actions.

Recordkeeping and Reporting

1. Monitor and record hours of operation for major sources.
2. For tune-ups, information on dates, results, procedures and manufacturer's specification.
3. The type and amount of fuel used over the 12 months prior to the biennial tune-up of the boiler.
4. For each boiler subject to an emission limit records of monthly fuel use by each boiler, including the type(s) of fuel and amount(s) used must be kept.
5. Electronic copy of reports of required performance tests using the Electronic Reporting Tool via EPA's Central Data Exchange.
6. For area and major sources notification of compliance status, submit statement of completed energy assessment.
7. For operating units that combust non-hazardous secondary materials that have been determined not to be solid waste pursuant to § 241.3(b)(1) a record which documents how the secondary material meets each of the legitimacy criteria under § 241.3(d)(1) must be kept.

COMAR 26.11.09 Amendments

COMAR 26.11.09.04 prohibitions will not apply to fuel-burning equipment installed after March 1, 2014 that burn only biomass fuels.

COMAR 26.11.09.06 shall not apply to fuel-burning equipment installed after March 1, 2014 that burns only biomass fuels; however, the particulate matter requirements of Regulation .12 of this Chapter will apply to new biomass units.

COMAR 26.11.09.07 shall not apply to fuel-burning equipment installed after March 1, 2014 that burns only biomass fuels

COMAR 26.11.09.12 Standards for Biomass Fuel-Burning Equipment Equal to or Greater Than 350,000 Btu/hr.

1. Standards and requirements are applicable to owners and operators of biomass fuel-burning equipment equal to or greater than 350,000 Btu/hr heat input capacity.
2. Federal requirements under 40 CFR 63 Subparts DDDDD and JJJJJJ, as amended, are applicable.
3. Requirements for new Biomass Fuel-Burning Equipment Greater Than or Equal to 10 MMBtu/hr Heat Input Capacity. Applicable standards
    a. A particulate matter emission standard of 0.07 lb/MMBtu heat input if the total heat input capacity is less than 30 MMBtu/hr;
    b. A particulate matter emission standard of 0.03 lb/MMBtu heat input if the total heat input capacity is equal to or greater than 30 MMBtu/hr;
    c. A NOx emission standard of 0.30 lb/MMBtu heat input, if the heat input capacity is less than or equal to 250 MMBtu/hr;
    d. A NOx emission standard of 0.25 lb/MMBtu heat input, if the heat input capacity is greater than 250 MMBtu/hr; and
    e. An initial and biennial tune-ups are conducted.
4. Requirements for Biomass Fuel-Burning Equipment Greater Than 1.5 MMBtu/hr and Less Than 10 MMBtu/hr Heat Input Capacity. Applicable standards:
    a. A particulate matter emission standard of 0.23 lb/MMBtu heat input in Areas I, II, V and VI;
    b. A particulate matter emission standard of 0.1 lb/MMBtu heat input in Areas III and IV;
    c. A NOx emission standard of 0.30 lb/MMBtu heat input; and
    d. An initial and biennial tune-ups are conducted.
5. Requirements for Biomass Fuel-Burning Equipment Less Than or Equal to 1.5 MMBtu/hr and Greater than 350,000Btu/hr Heat Input Capacity. Applicable standards:
    a. A particulate matter emission standard of 0.35 lb/MMBtu heat input in Areas I, II, V and VI;
    b. A particulate matter emission standard of 0.1 lb/MMBtu heat input in Areas III and IV;
    c. A NOx emission standard of 0.30 lb/MMBtu heat input; and
    d. An initial and biennial tune-ups are conducted.
6. Biomass fuel-burning equipment installed prior to March 1, 2014:
    a. An initial and biennial tune-ups are required to be conducted; and
    b. All the standards and requirements of must be complied with.

7. Biomass fuel-burning equipment operation in accordance with the design and maintenance specifications of the manufacturer in order to meet and maintain compliance with the applicable emission standards and performance requirements.
8. Startup and Shutdown Requirements. The biomass fuel burning equipment's startup and shutdown periods are required to be minimized following the:
   a. Manufacturer's recommended procedures, if available; or
   b. Recommended procedures for a unit of similar design for which manufacturer's recommended procedures are available if manufacturer's recommended procedures for the actual unit are not available.
9. Compliance.
   a. Testing following 40 CFR Part 60, Appendix A, as amended.
   b. Sources subject to §§D and E demonstrate compliance by providing certification, on a form provided by the Department, from the manufacturer that the fuel-burning equipment is designed and tested to meet the applicable particulate matter and NOx standards including a copy of test results with EPA approved test methods on fuel-burning equipment in the same model line as the new fuel-burning equipment.
   c. The particulate matter emission standards of §§C, D or E of this regulation and the requirements of 40 CFR 63 Subparts DDDDD and JJJJJJ, as amended, are required to be complied with by:
      (a) Demonstrating continuous compliance with the work practice and management practice standards as specified in 40 CFR 63; and
      (b) Complying with the monitoring, installation, operation, and maintenance requirements as specified in 40 CFR 63.
   d. Fuel-burning equipment with a heat-input capacity greater than or equal to 100 MMBtu/hr and less than 250 MMBtu/hr demonstrate compliance with §B(2) of Regulation .08.
   e. Fuel-burning equipment with a heat-input capacity greater than or equal to 250 MMBtu/hr demonstrate compliance by installing, operating, calibrating, and maintaining a certified NOx CEM in accordance with §C(3) of Regulation .08.

10 Record Keeping and Reporting. The following requirements are applicable:
   a. The recordkeeping and reporting requirements of 40 CFR 63 Subparts DDDDD and JJJJJJ, as amended.
   b. For the particulate matter emission standards of §§C, D or E of this regulation and for biomass fuel-burning equipment subject to the requirements of 40 CFR 63 Subparts DDDDD and JJJJJJ, as amended, the notification, reporting, and recordkeeping requirements of 40 CFR 63.
   c. For the NOx emission standards of §C of this regulation and biomass fuel-burning equipment subject to the requirements of 40 CFR 63 Subparts DDDDD and JJJJJJ, as amended, the reporting requirements of §K of Regulation .08 of this chapter.
   d. For the emission standards of §§C, D or E of this regulation and biomass fuel-burning equipment not subject to the requirements of 40 CFR 63 Subparts DDDDD and JJJJJJ keep records for each boiler that identify:
      (i) The date of tune-up operations;

(ii) The procedures followed for tune-up;
(iii) The manufacturer's specifications to which the boiler was tuned;
(iv) The occurrence and duration of each malfunction of the boiler, or of the associated air pollution control, or monitoring equipment;
(v) Actions taken during periods of malfunction to minimize emissions including corrective actions to restore the malfunctioning boiler, air pollution control, or monitoring equipment to its normal or usual manner of operation;

e. Maintain records on site for not less than 3 years, and make these records available to the Department upon request.

Expected Emissions Reductions

There are no emission reductions as a result of this action. New Regulation .12 will require MACT/GACT/BACT standards to be established for biomass fuel-burning equipment. This action, however, will have broad environmental benefits and reduce the amount of phosphorous and nitrogen entering the Chesapeake Bay and its tributaries.

Comparison to Federal Standards (Provide citation and name of federal standard)

Yes. Specifically, the NSPS 40 CFR 60 Subpart D, Db, Dc as well as NESHAP 40 CFR 63 Subpart DDDDD and JJJJJJ may apply to a proposed source in Maryland.

EPA's MACT established PM emission limits for biomass and other fuel-burning equipment greater than 10 MMBtu/hr heat input. The MACT also addresses PM as a surrogate for metals under hazardous air pollutants.

Where Federal regulations are more stringent than the Maryland regulations, the federal standards apply. Maryland proposed regulations establish PM standards for sources less than 10 MMBtu/hr heat input, where federal regulations are limited to optimization practices as established under GACT which is less restrictive for this size category. Maryland's proposed regulations also establish NOx standards for all biomass fuel-burning equipment.

Economic Impact on Affected Sources, the Department, other State Agencies, Local Government, other Industries or Trade Groups, the Public

As a result of the proposed amendments and new regulations, businesses in Maryland would accrue a potential net economic benefit over the lifetime of the unit. Biomass fuel, where readily and cost effectively available as a result of energy crop harvesting, sustainable forestry and poultry litter management practices can be used in fuel-burning equipment for energy recovery while meeting applicable standards and also reduce the amount of phosphorous and nitrogen entering the Chesapeake Bay and its tributaries.

<u>MDE</u>

The amendments to COMAR 26.11.09 and standards for biomass fuel-burning equipment will positively effect the Department in that the amendments will reduce the permit review and approval process by approximately 60 days.

Poultry Industry

Maryland produces approximately 500-600 million chickens a year, as a result, it is projected that close to 600-700 million pounds of poultry litter is produced. The industry is one of the state's most productive forms of agriculture, one of its largest employers, and has seen steady growth with increasing demand for low cost chicken and contributes close to $700 million to the Maryland economy. The application of technology that meets MACT/GACT/BACT standards to recover energy from poultry litter and other biomass materials would be useful to utilize renewable fuels and provide broad benefits to the environment. On a per dollar basis, approximately 30,000 Btu can be delivered from oil. Since poultry litter that is generated on site has minimal to no cost associated with it, close to the range of 80-90 % savings on fuel and energy costs can be realized from the utilization of poultry litter on an annual basis.

Wood Industry

Wood and forest products constitute approximately $4 billion a year industry in Maryland. Close to 40% of landmass in Maryland is covered with trees that contribute to the wood products. Maryland grows more wood than it cuts by shifting from being a passive custodian of forests to an active participant in economically utilizing a rejuvenating resource. Approximately 30 percent more wood is grown in the State than is cut, pointing to the potential reserve in renewable resource and economy. At current utilization level of this renewable resource, wood and forest products are the biggest industry in Western Maryland and No. 2 on the Eastern Shore behind poultry. Statewide, wood and forest industry supports some 10,000 jobs.

Wood fuel costs have a direct link to transportation costs. Taking into account an average range of wood costs and the lower efficiency of wood fuel-burning equipment, 40,000 Btu could be delivered per dollar. Savings realized from burning wood on an annual basis could be in the range of 30-40%.

Cost of Control and Fuel-Burning Equipment

Cost projections are based on published reports, industry and vendor information, on specific project costs, EPA reports or control device fact sheets, or actual BACT analysis information. Different options exist for boiler designers and manufacturers including the application of low cost advanced optimization technologies to reduce emissions and meet the standards. If the combination of the type of biomass fuel and boiler design needs further controls, then the following technologies and costs have to be considered.

1. Cyclone $10,000
2. Multi-Cyclone $15-25,000
3. Reeltration System $65-97,000
4. ESP

a. 10 MMBtu approx 3500 acfm ----$97,000.00
b. 15 MMBtu approx 7000 acfm ----$160,000.00
c. 20 MMBtu approx 11000 acfm ---$220,000.00
d. 25 MMBtu approx 14500 acfm ---$290,000.00
e. 30 MMBtu approx 22500 acfm ---$340,000.00

Capital cost for fuel-burning equipment, including the cost of controls necessary to meet the standards of the regulations, in the size range 1-100 MMBtu/hr heat input are provided below:

Equipment/ Boiler Size MMBtu/hr	Capital Cost	Control Cost Range
1) 1	$175,000	$10,000
2) 2	$350,000-$410,000	$10,000-15,000 Single cyclone
3) 10	$650,000-$725,000	$15,000-25,000 Multi cyclone
4) 20	$1-1.25 Million	ESP $220,000-300,000
5) 30	$ 4-6 Million	ESP $ 450,000-$550,000
6) 100	$12-20 Million	ESP $1.5- 2.0 Million

Economic Impact on Small Businesses

As a result of the proposed amendments and new regulations, small businesses in Maryland would accrue a potential net economic benefit over the lifetime of the unit. Biomass fuel, where readily and cost effectively available as a result of energy crop harvesting, sustainable forestry and poultry litter management practices can be used in fuel-burning equipment for energy recovery while meeting applicable standards. Biomass fuel derived from poultry litter management practices may also reduce the amount of phosphorous and nitrogen entering the Chesapeake Bay and its tributaries.

Attached Document:

Download Date 06-25-12

Title 26
DEPARTMENT OF THE ENVIRONMENT
Subtitle 11 AIR QUALITY
Chapter 09 Control of Fuel-Burning Equipment, Stationary Internal Combustion Engines, and Certain Fuel-Burning Installations

Authority: Environment Article, §§1-101, 1-404, 2-101—2-103, 2-301—2-303, 10-102, and 10-103, Annotated Code of Maryland

.01 Definitions.

A. In this chapter, the following terms have the meanings indicated.

B. Terms Defined.

(1) (text unchanged)

(1-1) "Biomass"

(a) Means solid organic material that can be combusted for use as fuel including the following:

(i) Wood residue and wood products (e.g., trees, tree stumps, tree limbs, bark, lumber, sawdust, sander dust, chips, scraps, slabs, millings, and shavings);

(ii) Animal manure, including litter and other bedding materials;

(iii) 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 prunings, corn stalks, coffee bean hulls and ground; and

(iv) Any solid organic material that has been approved by the Department, on a case-by-case basis, utilizing the criteria established by EPA and set forth in 40 C.F.R.241.3, as amended.

(b) This definition of biomass is not intended to suggest that these materials are or are not solid waste.

[(1-1)**]** *(1-2)* (text unchanged)

(2) – (3) (text unchanged)

(4) "Fuel" means:

(a) Coal or any other fossil fuel **[**and wood or wood products; and**]*;***

(b) Waste combustible fluid or used oil that has been approved by the Department to be burned as a fuel in accordance with Regulation .10 of this chapter; *and*

(c) Biomass as defined in this regulation, or approved by the Department.

(5) – (19) (text unchanged)

.02 — .03 (text unchanged)

.04 Prohibition of Certain New Fuel-Burning Equipment.

A. – B. (text unchanged)

C. Exceptions.

(1) *Fuel-Burning Equipment on Ships and Biomass Fuel-Burning Equipment.*

(a) **[**Fuel-Burning Equipment on Ships.**]** New fuel-burning equipment on ships is exempt from §§A(1) and B(1) of this regulation.

(b) The provisions of §§A and B of this regulation do not apply to fuel-burning equipment installed after May 1, 2014 that burns only biomass fuels.

(2) – (6) (text unchanged)

.05 (text unchanged)

.06 Control of Particulate Matter.

A. – C. (text unchanged)

D. *Small Wood Boilers and Biomass Fuel-Burning Equipment.*

(1) Small wood boilers are *subject to particulate matter requirements of Regulation .11 of this Chapter and* exempt from the provisions of §§A and B of this regulation.

(2) The provisions of §§A and B of this regulation shall not apply to fuel-burning equipment installed after May 1, 2014 that burns only biomass fuels; however, the particulate matter requirements of Regulation .12 of this Chapter apply.

.07 Control of Sulfur Oxides From Fuel-Burning Equipment.
A. (text unchanged)
B. Exceptions.
(1) – (4) (text unchanged)
(5) The provisions of §§A(1)(a) and A(2)(a) of this regulation shall not apply to fuel-burning equipment installed after May 1, 2014 that burns only biomass fuels.
C. (text unchanged)

.08 (text unchanged)

.09 Tables and Diagrams.

(Table 1 unchanged)

(a) Construction of residual oil fired units of less than 13 million Btu (13.7 gigajoules) per hour prohibited (see Regulation **[**.09A(1) and B(1))**]** *.04)*.
(b) (text unchanged)
(c) (text unchanged)

See Figures 1 & 2. (Figures unchanged)

Notes: (Notes unchanged)

.10 Requirements to Burn Used Oil and Waste Combustible Fluid as Fuel.
A. General Requirements.
(1) — (2) (text unchanged)
(3) A person who is burning used oil or WCF under a current written approval from the Department may continue to burn the approved material if:
(a) The person demonstrates that any WCF being burned satisfies the definition of that term in Regulation .01B**[**(23)**]** of this chapter;
(b) — (d) (text unchanged)
(4) — (7) (text unchanged)
B. — D. (text unchanged)

.11 (text unchanged)

.12 Standards for Biomass Fuel-Burning Equipment Equal to or Greater Than 350,000 Btu/hr.
A. Applicability. The requirements of this regulation apply to a person who owns or operates biomass fuel-burning equipment equal to or greater than 350,000 Btu/hr heat input capacity.
B. Federal Requirements. The requirements of 40 CFR 63 Subparts DDDDD and JJJJJJ, as amended, are applicable.
C. Requirements for Biomass Fuel-Burning Equipment Greater Than or Equal to 10 MMBtu/hr Heat Input Capacity. A person subject to the requirements of this regulation may not install or operate new biomass fuel-burning equipment, unless the following standards and requirements are met:
(1) A particulate matter emission standard of 0.07 lb/MMBtu heat input if the total heat input capacity is less than 30 MMBtu/hr;
(2) A particulate matter emission standard of 0.03 lb/MMBtu heat input if the total heat input capacity is equal to or greater than 30 MMBtu/hr;
(3) A NOx emission standard of 0.30 lb/MMBtu heat input, if the heat input capacity is less than or equal to 250 MMBtu/hr;
(4) A NOx emission standard of 0.25 lb/MMBtu heat input, if the heat input capacity is greater than 250 MMBtu/hr; and
(5) An initial and biennial tune-ups are conducted.
D. Requirements for Biomass Fuel-Burning Equipment Greater Than 1.5 MMBtu/hr and Less Than 10 MMBtu/hr Heat Input Capacity. A person subject to the requirements of this regulation may not install or operate new biomass fuel-burning equipment unless the following standards and requirements are met:
(1) A particulate matter emission standard of 0.23 lb/MMBtu heat input in Areas I, II, V and VI;
(2) A particulate matter emission standard of 0.1 lb/MMBtu heat input in Areas III and IV;
(3) A NOx emission standard of 0.30 lb/MMBtu heat input; and
(4) An initial and biennial tune-ups are conducted.
E. Requirements for Biomass Fuel-Burning Equipment Less Than or Equal to 1.5 MMBtu/hr and Greater than 350,000Btu/hr Heat Input Capacity. A person subject to the requirements of this regulation may not install or operate new biomass fired fuel-burning equipment that is less than equal to 1.5 MMBtu/hr heat input and greater than 350,000 Btu/hr heat input unless the following standards are met:

(1) A particulate matter emission standard of 0.35 lb/MMBtu heat input in Areas I, II, V and VI;

(2) A particulate matter emission standard of 0.1 lb/MMBtu heat input in Areas III and IV;

(3) A NOx emission standard of 0.30 lb/MMBtu heat input; and

(4) An initial and biennial tune-ups are conducted.

F. A person subject to the requirements of this regulation may not operate biomass fuel-burning equipment installed prior to March 1, 2014 unless:

(1) An initial and biennial tune-ups are conducted; and

(2) All the standards and requirements of §.03 and §§ .05 — .09 of this chapter are met.

G. A person subject to the requirements of this regulation shall operate the fuel-burning equipment in accordance with the design and maintenance specifications of the manufacturer in order to meet and maintain compliance with the applicable emission standards and performance requirements.

H. Startup and Shutdown Requirements. A person subject to the requirements of §§C, D and E shall minimize the boiler's startup and shutdown periods following the:

(1) Manufacturer's recommended procedures, if available; or

(2) Recommended procedures for a unit of similar design for which manufacturer's recommended procedures are available if manufacturer's recommended procedures for the actual unit are not available.

I. Compliance. A person subject to the requirements of:

(1) §C shall demonstrate compliance with the emissions standards by following 40 CFR Part 60, Appendix A, as amended.

(2) §§D and E shall demonstrate compliance by providing certification, on a form provided by the Department, from the manufacturer that the fuel-burning equipment is designed and tested to meet the applicable particulate matter and NOx standards including a copy of test results with EPA approved test methods on fuel-burning equipment in the same model line as the new fuel-burning equipment.

(3) The particulate matter emission standards of §§C, D or E of this regulation who owns or operates biomass fuel-burning equipment subject to the requirements of 40 CFR 63 Subparts DDDDD and JJJJJJ, as amended, shall:

(a) Demonstrate continuous compliance with the work practice and management practice standards as specified in 40 CFR 63; and

(b) Comply with the monitoring, installation, operation, and maintenance requirements as specified in 40 CFR 63.

(4) The NOx emission standards of §C of this regulation and who owns or operates biomass fuel-burning equipment subject to the requirements of 40 CFR 63 Subparts DDDDD and JJJJJJ, as amended, shall meet the following requirements:

(a) For fuel-burning equipment with a heat-input capacity greater than or equal to 100 MMBtu/hr and less than 250 MMBtu/hr, demonstrate compliance with the NOx emission standards of §C of this regulation in accordance with §B(2) of Regulation .08 of this chapter; and

(b) For fuel-burning equipment with a heat-input capacity greater than or equal to 250 MMBtu/hr subject to the requirements of §C shall demonstrate compliance with the NOx emission standards of regulation .12C in accordance with §B(2) of Regulation .08 of this chapter by installing, operating, calibrating, and maintaining a certified NOx CEM in accordance with §C(3) of Regulation .08 of this chapter.

J. Reporting and Recordkeeping Requirements.

(1) A person subject to the particulate matter emission standards of §§C, D or E of this regulation who owns or operates biomass fuel-burning equipment subject to the requirements of 40 CFR 63 Subparts DDDDD and JJJJJJ, as amended, shall comply with the notification, reporting, and recordkeeping requirements of 40 CFR 63.

(2) A person subject to the NOx emission standards of §C of this regulation and who owns or operates biomass fuel-burning equipment subject to the requirements of 40 CFR 63 Subparts DDDDD and JJJJJJ, as amended, shall comply with the reporting requirements of §K of Regulation .08 of this chapter.

(3) A person subject to the to the emission standards of §§C, D or E of this regulation who owns or operates biomass fuel-burning equipment not subject to the requirements of 40 CFR 63 Subparts DDDDD and JJJJJJ shall:

(a) Keep records for each boiler that identify:

(i) The date of tune-up operations;

(ii) The procedures followed for tune-up;

(iii) The manufacturer's specifications to which the boiler was tuned;

(iv) The occurrence and duration of each malfunction of the boiler, or of the associated air pollution control, or monitoring equipment;

(v) Actions taken during periods of malfunction to minimize emissions including corrective actions to restore the malfunctioning boiler, air pollution control, or monitoring equipment to its normal or usual manner of operation;

(b) Maintain records on site for not less than 3 years, and make these records available to the Department upon request.

Appendix A – Overview of EPA's Maximum Achievable Control Technology (MACT) / Generally Available Control Technology (GACT)

Maximum Achievable Control Technology / Generally Available Control Technology (MACT/GACT) Process for Industrial, Commercial and Institutional (ICI) Boilers

A. Summary

Biomass industrial, commercial and institutional boilers are subject to MACT/GACT standards based on the requirements of the Clean Air Act (CAA). Section (B), titled "CAA and MACT/GACT", provides an explanation of the broad set of CAA requirements that are applicable to all ICI boilers including biomass. Section (C), titled "ICI Boiler MACT/GACT Process", provides an overview of the actual standards development process and the results that were achieved based on technical and economic analyses, including industry and public comments.

The MACT/GACT review process covers all the hazardous air pollutants (HAP) from all types of ICI boilers, including biomass boilers. The review process was not limited to the group of HAPs that caused ICI boilers to be included initially as candidates for the MACT/GACT review. EPA developed the standards for all ICI boilers and differentiated the standards for boiler design and fuels based on performance results, technological and economic feasibility.

In the MACT development process the current level of emissions that are being achieved by the best-performing similar boilers were reviewed and a baseline that is known as the "MACT floor" for the new standard at 12 percent of best performing results was formed. As a result, the MACT standards at a minimum, achieve throughout the industry, a level of emissions control that is at least equivalent to the MACT floor. At this level the minimum criteria is met. Through the MACT process, if new technologies show promising results the EPA may establish more stringent standards when economic, environmental, and public health benefits can be achieved.

Under GACT for boilers less than 10 MMBtu/hr, EPA determined that numerical standards are not feasible based on technology and economic analysis. The tune-up requirements are appropriate for this size boiler category as combustion controls have developed to the level that the process can be controlled continuously with the help of manufacturer's specifications, fuel composition monitoring and periodic tune up and operational monitoring of parameters. The GACT requirements for small boilers include the following: 1. Inspect the flame pattern and burner. Adjust, test, clean, modify and replace as necessary under manufacturer's specifications. 2. Inspect the system controlling the air-to-fuel ratio, calibrate and assure proper operation. 3. Optimize total CO emissions consistent with manufacturer's specification. 4. Measure CO concentrations in the flue gas stream, both before and after the adjustments are made. A portable analyzer may be used to ensure compliance.

Further, to ensure continuous compliance the following requirements are applicable Records of the date of the tune-up, the procedures followed, and the manufacturer's specifications to which the boiler was tuned are required. Following each tune-up, an onsite report that contains (i) the concentrations of CO and oxygen before and after the tune-up, (ii) a description of any corrective actions taken as a part of the tune-up, and (iii) the type and amount of fuel used over the 12 months prior to the tune-up of the boiler, but only if the boiler was physically and legally capable of using more than one type of fuel during that period is required.[1] The records must be maintained on site and submitted if requested.

GACT is also applicable to small boilers during start up and shut down periods. Manufacturer's specifications are required to be fully implemented. Through the technical and economic analysis the performance data confirmed, for this size category, the combination of controls for air to fuel ratio and manufacturer's specification are sufficient to ensure optimum performance of the combustion process.

B. CAA and MACT/GACT

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[1] § 63.11223 How do I demonstrate continuous compliance with the work practice and management practice standards?

The authority to develop standards for HAP is under CAA Section 112. Specifically, Section 112(d) of the CAA requires national emission standards for hazardous air pollutants (NESHAP) for both major and area sources of HAP that are listed for regulation under CAA section 112(c). A major source is any stationary source that emits or has the potential to emit 10 tons per year (tpy) or more of any single HAP or 25 tpy or more of any combination of HAP.

An area source is a stationary source that is not a major source. CAA section 112(k)(3)(B) requires the identification of at least 30 HAPs that, as a result of emissions from area sources, pose the greatest threat to public health. In the Integrated Urban Air Toxics Strategy, EPA identified 30 HAPs that pose the greatest potential health threat in urban areas. Section 112(c)(3) of the CAA requires the listing of sufficient categories or subcategories of area sources to ensure that area sources representing 90 percent of the emissions of the 30 urban HAPs are subject to regulation.

Under CAA section 112(d)(5), the EPA may elect to promulgate standards or requirements for area sources which provide for the use of GACT or management practices by such sources to reduce emissions of hazardous air pollutants. GACT is the basis for standards for most types of HAP emitted from area sources. CAA section 112(c)(6) requires that the EPA list categories and subcategories of sources assuring that sources accounting for not less than 90 percent of the aggregate emissions of each of seven specified HAPs are subject to standards under CAA sections 112(d)(2) or (d)(4), which require the application of the more stringent MACT.

ICI boiler category is part of the list that contributes 90 percent of the following seven HAPs specified in CAA section 112(c)(6): Alkylated lead compounds, polycyclic organic matter (POM) as 7- polynuclear aromatic hydrocarbons (PAH), hexachlorobenzene, mercury, polychlorinated biphenyls (PCBs), 2,3,7,8-tetrachlorodibenzofurans, and 2,3,7,8-tetrachlorodibenzo-p-dioxin. ICI boilers combusting oil or biomass are listed under CAA section 112(c)(3) for their contribution of mercury, arsenic, beryllium, cadmium, lead, chromium, manganese, nickel, POM, ethylene dioxide, and PCBs. As such, the GACT standards for oil or biomass boilers are broad based and not limited to a sub-group of HAPs as they cover all of the urban HAPs, based upon reasonable and cost effective approaches consistent with the requirements of the CAA.

C. ICI Boiler MACT/GACT Process

The MACT standards for ICI boilers were developed to reduce the effects of HAPs emitted as a result of the combustion of oil, coal, natural gas and biomass. The MACT review and development process takes into account the practically feasible and readily available control options. The term "control technology" in MACT includes emission control devices, such as scrubbers, thermal oxidizers, ESPs, multi-cyclones, other add-on control devices and measures, processes, methods, systems, techniques or innovative modifications that are used to limit the emissions of HAPs from boilers.

MACT standards affect existing and new boilers. A distinguishing feature of the MACT process is that standards are based on actual performance in a particular category of boilers. The emission levels already achieved by the best-performing boilers play a leading role in the process. This MACT determination process involving direct performance-based approach produces standards that are reasonable and effective in reducing HAP emissions. This approach ensures that the economic impact and benefit for controls is uniform for the category of boilers and efficient controls are fully utilized by all operators.

For ICI boilers, EPA developed MACT standards specific to each type of boiler category differentiated by fuels. The current level of emissions that are being achieved by the best-performing similar boilers were reviewed. These emission levels were then used to set a baseline that is known as the "MACT floor" for the new standard at 12 percent of best performing results. As a result, the MACT standards at a minimum, achieve throughout the industry, a level of emissions control that is at least equivalent to the MACT floor.

EPA conducted sector specific analysis for ICI boilers utilizing a national emissions data base. New standards for categories of boilers that resulted from the MACT process are:1. Stokers/sloped grate/other units designed to burn kiln dried biomass/bio-based solid; 2. Suspension burners designed to burn biomass/bio-based solid; 3. Fuel cells designed to burn biomass/bio-based solid; 4. Hybrid suspension/grate burners designed to burn wet biomass/bio-based solid; 5. Dutch ovens/pile burners designed to burn biomass/bio-based solid; 6. Fluidized bed units with an integrated fluidized bed heat exchanger designed to burn coal/solid fossil fuel and other types of boilers.

Appendix B – Maryland Biomass Legislation – Senate Bill 797

SENATE BILL 797

C5 3lr1990
CF HB 1084

By: **Senator Middleton**
Introduced and read first time: February 1, 2013
Assigned to: Finance

Committee Report: Favorable with amendments
Senate action: Adopted
Read second time: March 15, 2013

CHAPTER ______

AN ACT concerning

~~Renewable Energy Portfolio Standard – Wood– and Plant–Derived Biomass Systems~~
<u>Thermal Energy – Task Force and Regulations</u>

FOR the purpose of ~~providing that energy from a certain wood– and plant–derived biomass system is eligible for inclusion in meeting the renewable energy portfolio standard; providing that a person that owns a wood– and plant–derived biomass system shall receive a certain renewable energy credit calculated in a certain manner; requiring the Public Service Commission to adopt certain regulations for the metering, verification, and reporting of energy output from wood– and plant–derived biomass systems; providing that energy produced by a wood– and plant–derived biomass system shall be eligible for inclusion in meeting the renewable energy portfolio standard for certain compliance years; defining certain terms; altering certain definitions; providing for the effective date of this Act; and generally relating to the renewable energy portfolio standard and wood– and plant–derived biomass systems~~ <u>establishing the Maryland Thermal Renewable Energy Credit Task Force; providing for the composition, chair, and staffing of the Task Force; prohibiting a member of the Task Force from receiving certain compensation, but authorizing the reimbursement of certain expenses; requiring the Task Force to analyze how to restructure the renewable energy portfolio standard to incorporate certain thermal energy sources; requiring the Task Force to make certain determinations and consider the impact of certain changes; requiring the Task Force to report its findings and recommendations to the Governor and the General Assembly on or before a certain date; providing for the termination of</u>

EXPLANATION: **CAPITALS INDICATE MATTER ADDED TO EXISTING LAW**.
[Brackets**]** indicate matter deleted from existing law.
<u>Underlining</u> indicates amendments to bill.
~~Strike out~~ indicates matter stricken from the bill by amendment or deleted from the law by amendment.

the Task Force; requiring the Department of the Environment to publish certain regulations to facilitate the commissioning of certain solid fuel boilers in the State under certain circumstances; and generally relating to the establishment of the Maryland Thermal Renewable Energy Credit Task Force and the regulation of thermal energy.

~~BY repealing and reenacting, with amendments,~~
~~Article – Public Utilities~~
~~Section 7–701~~
~~Annotated Code of Maryland~~
~~(2010 Replacement Volume and 2012 Supplement)~~

~~BY adding to~~
~~Article – Public Utilities~~
~~Section 7–704(j)~~
~~Annotated Code of Maryland~~
~~(2010 Replacement Volume and 2012 Supplement)~~

~~Preamble~~

~~WHEREAS, The General Assembly recognizes the importance of supporting Maryland's efforts to produce energy, to the extent practicable, from in–State resources in order to help meet the State's clean, renewable energy goals; and~~

~~WHEREAS, The General Assembly is committed to the promotion of the creation of green energy jobs in Maryland; and~~

~~WHEREAS, The General Assembly also encourages the Department of General Services to consider the use of renewable energy, including the use of biomass systems using wood– and plant–derived biomass sources, when developing procurement guidelines; now, therefore,~~

SECTION 1. BE IT ENACTED BY THE GENERAL ASSEMBLY OF MARYLAND, That:

(a) There is a Maryland Thermal Renewable Energy Credit Task Force.

(b) The Task Force consists of the following 14 members:

(1) one member of the Senate of Maryland, appointed by the President of the Senate;

(2) one member of the House of Delegates, appointed by the Speaker of the House;

(3) the Director of the Maryland Energy Administration;

(4) the Secretary of Natural Resources, or the Secretary's designee;

(5) the Secretary of the Environment, or the Secretary's designee;

(6) the Secretary of Agriculture, or the Secretary's designee;

(7) the Executive Director of the Technical Staff of the Maryland Public Service Commission, or the Executive Director's designee; and

(8) the following seven members, appointed by the Governor:

(i) one representative of the solar industry;

(ii) one representative of the animal–waste bioenergy industry;

(iii) one representative of the geothermal industry;

(iv) one representative of the forest products industry;

(v) one representative from the Sustainable Forestry Council;

(vi) one representative of the biomass thermal energy industry; and

(vii) one representative of the environmental community.

(c) The Director of the Maryland Energy Administration shall be the chair of the Task Force.

(d) The Maryland Energy Administration shall provide staff for the Task Force.

(e) A member of the Task Force:

(1) may not receive compensation as a member of the Task Force; but

(2) is entitled to reimbursement for expenses under the Standard State Travel Regulations, as provided in the State budget.

(f) In accordance with subsection (g) of this section, the Task Force shall:

(1) analyze how to restructure the renewable energy portfolio standard under Title 7, Subtitle 7 of the Public Utilities Article to incorporate thermal energy sources, including energy derived from wood–derived biomass;

(2) determine whether it is appropriate to create a separate compliance tier for thermal energy sources;

(3) determine an appropriate method of awarding renewable energy credits for thermal energy sources, including energy derived from wood–derived biomass; and

(4) determine any other changes to State law that the Task Force deems appropriate to incorporate thermal energy sources in the renewable energy portfolio standard.

(g) In conducting the analysis and determinations required under subsection (f) of this section, the Task Force shall consider the impact of any proposed changes on:

(1) the State's ability to:

(i) meet the greenhouse gas reduction goal under § 2–1204 of the Environment Article;

(ii) achieve the goals set forth in the State's renewable energy portfolio standards under § 7–703 of the Public Utilities Article; and

(iii) utilize wood–derived biomass to help meet the State's renewable energy goals, consistent with § 5–102 of the Natural Resources Article; and

(2) any other factor the Task Force deems appropriate.

(h) On or before December 31, 2013, the Task Force shall report its findings and recommendations to the Governor and, in accordance with § 2–1246 of the State Government Article, the General Assembly.

SECTION 2. AND BE IT FURTHER ENACTED, That the Department of the Environment shall publish by October 1, 2013, a proposed regulation revising COMAR 26.11.09.04 to facilitate the commissioning of small– to medium–scale solid fuel boilers in the State that meet environmental standards that the Department of the Environment deems appropriate.

~~SECTION 1. BE IT ENACTED BY THE GENERAL ASSEMBLY OF MARYLAND, That the Laws of Maryland read as follows:~~

~~**Article – Public Utilities**~~

~~7–701.~~

~~(a) In this subtitle the following words have the meanings indicated.~~

~~(b) "Administration" means the Maryland Energy Administration.~~

~~(c) "Fund" means the Maryland Strategic Energy Investment Fund established under § 9–20B–05 of the State Government Article.~~

~~(c–1) "Geothermal heating and cooling system" means a system that:~~

~~(1) exchanges thermal energy from groundwater or a shallow ground source to generate thermal energy through a geothermal heat pump or a system of geothermal heat pumps interconnected with any geothermal extraction facility that is:~~

~~(i) a closed loop or a series of closed loop systems in which fluid is permanently confined within a pipe or tubing and does not come in contact with the outside environment; or~~

~~(ii) an open loop system in which ground or surface water is circulated in an environmentally safe manner directly into the facility and returned to the same aquifer or surface water source;~~

~~(2) meets or exceeds the current federal Energy Star product specification standards;~~

~~(3) replaces or displaces inefficient space or water heating systems whose primary fuel is electricity or a nonnatural gas fuel source;~~

~~(4) replaces or displaces inefficient space cooling systems that do not meet federal Energy Star product specification standards;~~

~~(5) is manufactured, installed, and operated in accordance with applicable government and industry standards; and~~

~~(6) does not feed electricity back to the grid.~~

~~(d) "Industrial process load" means the consumption of electricity by a manufacturing process at an establishment classified in the manufacturing sector under the North American Industry Classification System, Codes 31 through 33.~~

~~(e) "Old growth timber" means timber from a forest:~~

~~(1) at least 5 acres in size with a preponderance of old trees, of which the oldest exceed at least half the projected maximum attainable age for the species; and~~

~~(2) that exhibits several of the following characteristics:~~

~~(i) shade–tolerant species are present in all age and size classes;~~

~~(ii) randomly distributed canopy gaps are present;~~

~~(iii) a high degree of structural diversity characterized by multiple growth layers reflecting a broad spectrum of ages is present;~~

~~(iv) an accumulation of dead wood of varying sizes and stages of decomposition accompanied by decadence in live dominant trees is present; and~~

~~(v) pit and mound topography can be observed.~~

~~(f) "PJM region" means the control area administered by the PJM Interconnection, Inc., as the area may change from time to time.~~

~~(g) "Poultry litter" means the fecal and urinary excretions of poultry, including wood shavings, sawdust, straw, rice hulls, and other bedding material for the disposition of manure.~~

~~(h) (1) "Qualifying biomass" means a nonhazardous, organic material that is available on a renewable or recurring basis, and is:~~

~~(i) waste material that is segregated from inorganic waste material and is derived from sources including:~~

~~1. except for old growth timber, any of the following forest–related resources:~~

~~A. mill residue, except sawdust and wood shavings;~~

~~B. precommercial soft wood thinning;~~

~~C. slash;~~

~~D. brush; or~~

~~E. yard waste;~~

~~2. a pallet, crate, or dunnage;~~

~~3. agricultural and silvicultural sources, including tree crops, vineyard materials, grain, legumes, sugar, and other crop by–products or residues; or~~

~~4. gas produced from the anaerobic decomposition of animal waste or poultry waste; or~~

~~(ii) a plant that is cultivated exclusively for purposes of being used at a Tier 1 renewable source or a Tier 2 renewable source to produce electricity.~~

~~(2) "Qualifying biomass" includes biomass listed in paragraph (1) of this subsection that is used for co–firing, subject to § 7–704(d) of this subtitle.~~

~~(3) "Qualifying biomass" does not include:~~

~~(i) unsegregated solid waste or postconsumer wastepaper; or~~

~~(ii) an invasive exotic plant species.~~

~~(h–1) "Thermal biomass system" means a system that:~~

~~(1) uses:~~

~~(i) primarily animal manure, including poultry litter, and associated bedding to generate thermal energy; and~~

~~(ii) food waste or qualifying biomass for the remainder of the feedstock;~~

~~(2) is used in the State; and~~

~~(3) complies with all applicable State and federal statutes and regulations, as determined by the appropriate regulatory authority.~~

~~(i) "Renewable energy credit" or "credit" means a credit equal to the generation attributes of 1 megawatt–hour of electricity~~ ~~**OR RENEWABLE THERMAL ENERGY EQUIVALENT**~~ ~~that is derived from a Tier 1 renewable source or a Tier 2 renewable source that is located:~~

~~(1) in the PJM region; or~~

~~(2) outside the area described in item (1) of this subsection but in a control area that is adjacent to the PJM region, if the electricity is delivered into the PJM region.~~

~~(j) "Renewable energy portfolio standard" or "standard" means the percentage of electricity sales at retail in the State that is to be derived from Tier 1 renewable sources and Tier 2 renewable sources in accordance with § 7–703(b) of this subtitle.~~

~~(k) "Renewable on–site generator" means a person who generates electricity on site from a Tier 1 renewable source or a Tier 2 renewable source for the person's own use.~~

~~(k–1)~~ ~~**"RENEWABLE THERMAL ENERGY EQUIVALENT" MEANS THE ELECTRICAL EQUIVALENT IN MEGAWATT–HOURS OF RENEWABLE THERMAL ENERGY CALCULATED BY DIVIDING THE HEAT CONTENT, MEASURED IN BTUS,**~~

~~**OF THE RENEWABLE THERMAL ENERGY AT THE POINT OF TRANSFER TO A HEAT–DEPENDENT PROCESS BY THE STANDARD CONVERSION FACTOR OF 3.412 MILLION BTUS PER MEGAWATT–HOUR.**~~

~~**(K–2)**~~ ~~(1) "Solar water heating system" means a system that:~~

~~(i) is comprised of glazed liquid–type flat–plate or tubular solar collectors as defined and certified to the OG–100 standard of the Solar Ratings and Certification Corporation;~~

~~(ii) generates energy using solar radiation for the purpose of heating water; and~~

~~(iii) does not feed electricity back to the electric grid.~~

~~(2) "Solar water heating system" does not include a system that generates energy using solar radiation for the sole purpose of heating a hot tub or swimming pool.~~

~~(l) "Tier 1 renewable source" means one or more of the following types of energy sources:~~

~~(1) solar energy, including energy from photovoltaic technologies and solar water heating systems;~~

~~(2) wind;~~

~~(3) qualifying biomass;~~

~~(4) methane from the anaerobic decomposition of organic materials in a landfill or wastewater treatment plant;~~

~~(5) geothermal, including energy generated through geothermal exchange from or thermal energy avoided by, groundwater or a shallow ground source;~~

~~(6) ocean, including energy from waves, tides, currents, and thermal differences;~~

~~(7) a fuel cell that produces electricity from a Tier 1 renewable source under item (3) or (4) of this subsection;~~

~~(8) a small hydroelectric power plant of less than 30 megawatts in capacity that is licensed or exempt from licensing by the Federal Energy Regulatory Commission;~~

~~(9) poultry litter–to–energy;~~

~~(10) waste–to–energy;~~

~~(11) refuse–derived fuel; **[**and**]**~~

~~(12) thermal energy from a thermal biomass system**; AND**~~

~~**(13) ENERGY FROM A WOOD– AND PLANT–DERIVED BIOMASS SYSTEM.**~~

~~(m) "Tier 2 renewable source" means hydroelectric power other than pump storage generation.~~

~~**(N) (1) "WOOD– AND PLANT–DERIVED BIOMASS SYSTEM" MEANS A SYSTEM THAT:**~~

~~**(I) EXCEPT AS PROVIDED IN PARAGRAPH (2) OF THIS SUBSECTION, USES QUALIFYING BIOMASS; AND**~~

~~**(II) PROVIDES ENERGY USED FOR:**~~

~~**1. SPACE OR WATER HEATING OR COOLING;**~~

~~**2. COMBINED HEAT AND POWER;**~~

~~**3. HUMIDITY CONTROL; OR**~~

~~**4. THERMAL END USE FOR WHICH FUEL OR ELECTRICITY OTHERWISE WOULD BE CONSUMED.**~~

~~**(2) "WOOD– AND PLANT–DERIVED BIOMASS SYSTEM" DOES NOT INCLUDE A SYSTEM THAT USES GAS PRODUCED FROM THE ANAEROBIC DECOMPOSITION OF ANIMAL WASTE OR POULTRY WASTE.**~~

~~7–704.~~

~~**(J) (1) ENERGY FROM A WOOD– AND PLANT–DERIVED BIOMASS SYSTEM COMMISSIONED ON OR AFTER JULY 1, 2013 IS ELIGIBLE FOR INCLUSION IN MEETING THE RENEWABLE ENERGY PORTFOLIO STANDARD.**~~

~~**(2) A PERSON THAT OWNS A WOOD– AND PLANT–DERIVED BIOMASS SYSTEM SHALL RECEIVE A RENEWABLE ENERGY CREDIT FOR THE RENEWABLE THERMAL ENERGY EQUIVALENT PRODUCED BY THE WOOD– AND PLANT–DERIVED BIOMASS SYSTEM.**~~

~~**(3) THE COMMISSION SHALL ADOPT REGULATIONS FOR THE METERING, VERIFICATION, AND REPORTING OF THE ENERGY OUTPUT OF WOOD– AND PLANT–DERIVED BIOMASS SYSTEMS.**~~

~~SECTION 2. AND BE IT FURTHER ENACTED, That energy produced by a wood– and plant–derived biomass system shall be eligible for inclusion in meeting the renewable energy portfolio standard for compliance years starting with 2014.~~

SECTION 3. AND BE IT FURTHER ENACTED, That this Act shall take effect ~~January 1, 2014~~ June 1, 2013.

Approved:

Governor.

President of the Senate.

Speaker of the House of Delegates.

Appendix C – PM as a surrogate for Hazardous Air Pollutants

I. Hazardous Air Pollutants (HAPs)

As required under Clean Air Act (CAA), the MACT development process involved the review of technology and economic data to establish feasible and readily available controls for boilers. Emission standards are set based on the data of best performing boilers (top 12% of fuel category), within cost parameters. Measures, processes, methods, systems, techniques and innovative modifications are used to limit the emissions of hazardous air pollutant (HAPs) or air toxics from boilers.

Standards and requirements under MACT are applicable to the biomass fuel and the boiler to control HAPs. The MACT sets specific evaluation, analysis approval procedure for fuel HAPs control and specific standards and requirements that are applicable for HAPs that result from the combustion process of the boiler.

1. HAP Content of Fuel

Fuel HAPs are controlled through the non-hazardous secondary materials approval (NHSM) process. Fuel analysis data on biomass being burned is required to be maintained at site. NHSM fuels have to meet the approval criteria, for storage, handling, energy content and contaminant levels in the fuels. For poultry litter for instance, an analysis data for typical poultry litter could be used covering: A. Metals: 1.Antimony; 2. Arsenic; 3. Beryllium; 4. Cadmium; 5. Chromium; 6. Cobalt; 7. Lead; 8. Manganese; 9. Mercury; 10. Nickel; and 11. Selenium. B. Total halogens including chlorine and fluorine; and C. Nitrogen and Sulfur.

If the comparison of fuel HAPs shows concentration less than traditional fuel then the biomass fuel can be burned.

2. HAPs from Biomass Combustion

For the boiler MACT, standards for the following HAPs were reviewed 1. Arsenic; 2. Benzene; 3. Beryllium; 4. Cadmium; 5. Chlorine; 6. Chromium; 7. Formaldehyde; 8. Hydrogen chloride; 9. Hydrogen fluoride; 10. Lead; 11. Manganese; 12. Mercury; 13. Nickel; 14. Selenium, and 15. Organic HAPs –dioxin and other polycyclic aromatic hydrocarbons.

II. Classification of HAPs and Selection of Surrogates by EPA

1. PM as Surrogate for Non-Mercury Metallic HAPs

For non-mercury metallic HAPs, PM was chosen as surrogate. Cost-effectiveness of using PM as a surrogate in place of individual HAPs was the main reason. Measurement of individual HAPs is a lot of times costly and at times infeasible also. PM standards and controls accomplish the control of fly ash, the carrier of non-mercury metallic HAPs.

2. HCL as Surrogate for Inorganic HAPs-Acid Gases

For inorganic HAPs, hydrogen chloride (HCl) was chosen as a surrogate. Primary inorganic HAPs emitted from boilers and process heaters are acid gases, with HCl present in the largest amounts. Other inorganic compounds emitted are found in much smaller quantities. Control technologies that reduce HCl also control other inorganic compounds that are acid gases.

3. Carbon Monoxide (CO) as Surrogate for Organic HAPs

CO was chosen as a surrogate to represent the variety of organic compounds, including dioxins from combustion process. Organic HAPs are emitted from the various fuels burned in boilers and process heaters and CO is a good indicator of incomplete combustion as there is direct correlation between CO emissions and the formation of organic HAP emissions. Monitoring equipment for CO is readily available, which is not the case for organic HAPs.

The MACT process extensively uses cost-effectiveness criteria in the selection of surrogates and in establishing standards and requirements.

III. EPA Surrogate Precedent

The practice of using particulate matter (PM) as a surrogate for non-Hg metallic hazardous air pollutants (HAPs) has been extensively argued and debated by environmental groups, industry, and EPA and the issue ultimately settled in court findings. Based on a review of published documents, the use of PM as a surrogate for non-Hg metallic HAPs is economic and that the emission control technology used for non-Hg metallic HAPs is also effective for control of PM.

Studies conducted on behalf of the EPA show a correlation between total particulate matter and non-HG metallic HAPs. Thus, there is a significant economic benefit to allowing fuel burning equipment to test for total PM rather than numerous non-Hg metallic HAPs (antimony, arsenic, beryllium, cadmium, chromium, cobalt, lead, manganese, nickel and selenium).

EPA further has found that emission control equipment designed to reduce PM emissions are effective at reducing HAP emissions. In 75 FR 32005 (6/4/2010), the EPA stated that the same control techniques that would be used to control the fly-ash PM will control non-mercury metallic HAP.

These two considerations, plus the sustained use of PM as a surrogate for non-HG metallic HAPs in numerous applications, including 40 CFR 63, Subpart DDDDD, National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters, and Subpart JJJJJ, National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers, supports MDE's position on the use of PM as a surrogate for non-Hg metallic HAPs.

Below are sections of pertinent documents associated with this topic; additional references are listed at the end of this document.

http://www.leagle.com/decision/2000858233F3d625_1783

233 F.3d 625 (2000)

NATIONAL LIME ASSOCIATION, Petitioner,

v.

ENVIRONMENTAL PROTECTION AGENCY, Respondent.

United States Court of Appeals, District of Columbia Circuit.
Argued September 5, 2000.
Decided December 15, 2000.
As Amended on Denial of Rehearing February 14, 2001.

Hunter L. Prillaman argued the cause for petitioner National Lime Association. With him on the briefs were Arline M. Seeger and Kenneth A. Rubin.

James S. Pew argued the cause for petitioner Sierra Club. With him on the briefs was Howard I. Fox.

Daniel M. Flores, Attorney, U.S. Department of Justice, argued the cause for respondent. With him on the brief were Lois J. Schiffer, Assistant Attorney General, Daniel R. Dertke, Attorney, and Steven E. Silverman, Attorney, Environmental Protection Agency. Christopher S. Vaden and H. Michael Semler, Attorneys, U.S. Department of Justice, entered appearances.

William M. Bumpers was on the brief for amicus curiae the American Portland Cement Alliance.

Before: EDWARDS, Chief Judge, GINSBURG and TATEL, Circuit Judges.

Opinion for the Court filed by Circuit Judges GINSBURG and TATEL.*

GINSBURG and TATEL, Circuit Judges:

In this case we consider petitions by the Sierra Club and the National Lime Association challenging the Environmental Protection Agency's hazardous air pollutant emission regulations for cement manufacturing. With respect to the Sierra Club petition we (1) reject its challenge to the emission standards for hazardous metals and dioxin/furan; (2) find the Agency's failure to set standards for hydrogen chloride, mercury, and total hydrocarbons contrary to the Clean Air Act's plain language; (3) direct EPA to consider the health impacts of potentially stricter standards for hazardous metals; and (4) sustain the regulation's monitoring requirements. Concluding that the National Lime Association has associational standing, we (1) reject its argument that EPA's use of particulate matter as a surrogate for non-volatile metal hazardous air pollutants violates the Clean Air Act and is arbitrary and capricious; and (2) reject its challenge to the testing method EPA adopted for determining whether a manufacturer qualifies as a "major source" of hazardous air pollutants.

http://www.epa.gov/ttn/atw/boiler/majorboilercom_vol_2_fnl.pdf

EPA’s use of surrogates is well-supported by longstanding case law. Surrogates may be used for compounds regulated under section 112 where it is reasonable to do so and not otherwise contrary to law. Nat’l Lime Ass’n v. EPA, 233 F.3d 625, 637 (D.C. Cir. 2000); see also Kennecott Greens Creek Mining Company v. Mine Safety and Health Administration, 476 F.3d 946, 955 (D.C. Cr. 2007) ("there is nothing inherently problematic with an agency regulating one substance as a surrogate for another substance") (citing Nat’l Lime). In assessing the reasonableness of EPA’s use of a surrogate, courts look to whether EPA has demonstrated a correlation between the HAP and the surrogate. Id.; see also Mossville Envt’l Action Now v. EPA, 370 F.3d 1232, 1242 (D.C. Cir. 2004) (invalidating use of vinyl chloride as surrogate where EPA failed to demonstrate correlation to HAP); Sierra Club v. EPA, 353 F.3d 976, 985 (D.C. Cir. 2004). While EPA’s use of surrogates is supported by case law and by CIBO when appropriate, the following are comments that address outstanding issues with regard to EPA’s use of surrogates in the Proposed Rule.

http://www.gpo.gov/fdsys/pkg/FR-2013-01-31/pdf/2012-31646.pdf
40 CFR Part 63

National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters; Final Rule

Federal Register / Vol. 78 , No. 21 / Thursday, January 31, 2013 /
Rules and Regulations

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ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 63

[EPA-HQ-OAR-2002-0058; FRL-9676-8]
RIN 2060-AR13

National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule; notice of final action on reconsideration.

Purpose of This Regulatory Action
The EPA is taking final action on its proposed reconsideration of certain provisions of its March 21, 2011, final rule that established standards for new and existing industrial, commercial, and institutional boilers and process heaters at major sources of hazardous

air pollutants. Section 112(d) of the CAA requires the EPA to regulate HAP from major stationary sources based on the performance of MACT. Section 112(h) of the CAA allows the EPA to establish work practice standards in lieu of numerical emission limits only in cases where the agency determines that it is not feasible to prescribe or enforce an emission standard, including circumstances in which the agency determines that the application of measurement methodology is not practicable due to technological and economic limitations. The EPA is revising certain MACT standards established in March 2011 for boilers and process heaters, including standards for CO--as a surrogate for organic HAP; HCl--as a surrogate for acid gas HAP; Hg; TSM or filterable PM--as a surrogate for non-Hg metallic HAP; and dioxin/furan.

Issue: PM is not an adequate surrogate for non-mercury metallic HAP.

The petitioner (Sierra Club) requested that the EPA remove the PM standard as a surrogate for non-mercury metallic HAP and instead adopt a numeric limit for non-mercury metallic HAP because PM is not an appropriate surrogate. The EPA is denying the request for reconsideration on this issue. While the EPA disagrees with the petitioner's argument regarding the suitability of PM as a surrogate for non-mercury metallic HAP, the petitioner has not demonstrated that it lacked the opportunity to comment on this issue. The EPA proposed PM standards as a surrogate for non-mercury metallic HAP and explained in the proposal the agency's basis for concluding that PM was an appropriate surrogate. 75 FR at 32018. Therefore, the EPA is denying the request for reconsideration.

http://www.gpo.gov/fdsys/pkg/FR-2013-02-01/pdf/2012-31645.pdf
40 CFR Part 63

National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers; Final Rule

Federal Register / Vol. 78 , No. 22 / Friday, February 1, 2013 /
Rules and Regulations

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ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 63

[EPA-HQ-OAR-2006-0790; FRL-9698-5]
RIN 2060-AR14

National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule; notice of final action on reconsideration.

Summary of Major Reconsideration Provisions

In general, the final rule requires facilities classified as area sources of HAP with affected boilers to reduce emissions of harmful toxic air emissions from these combustion sources, improving air quality, and protecting public health in communities where these facilities are located.

Recognizing the diversity of this source category and the multiple sectors of the economy this rule affects, the EPA is establishing seven subcategories for boilers based on the design of the combustion equipment and operating schedules of the unit. In addition to the coal, biomass, and oil subcategories in the March 2011 final rule, we are establishing subcategories for seasonal boilers, limited-use boilers, oil-fired boilers with heat input capacity of equal to or less than 5 MMBtu/hr, and certain boilers that use a continuous oxygen trim system.

Numerical emission limits, based on MACT, are established for Hg and CO at new and existing large coal-fired boilers (i.e., with a design heat input capacity of 10 MMBtu/hr or more). A review of the data has resulted in changes to the Hg and CO emission limits contained in the March 2011 final rule. The EPA is also establishing a CEMS alternative compliance option for the numeric CO emission limit. Coal-fired boilers subject to a CO emission limit can comply with the limit using a periodic stack test and CPMS, or by using CEMS. The CO CEMS alternative compliance option is based on a 10-day rolling average and provides additional compliance flexibility to sources with existing CO CEMS equipment. New and existing small coal-fired units (i.e., with a design heat input capacity of less than 10 MMBtu/hr) are subject to periodic tune-up work practices for CO and Hg in lieu of numeric emission limits because the EPA found that it was technologically and economically impracticable to apply measurement methodology to these small sources, pursuant to CAA section 112(h).

Numerical emission limits, based on GACT, are established for PM as a surrogate for urban metal HAP other than Hg for new large coal-fired boilers. New and existing small coal-fired boilers are subject to periodic tune-up management practices for PM as a surrogate for urban metal HAP other than Hg, and for CO as a surrogate for urban organic HAP other than POM, based on GACT.

New large biomass- and oil-fired boilers are subject to numerical emission limits for PM as a surrogate for urban metal HAP, based on GACT. Existing biomass and oil-fired boilers and new small biomass- and oil-fired boilers are subject to periodic tune-up management practices for PM as a surrogate for urban metal HAP, based on GACT. New and existing biomass- and oil-fired boilers are subject to periodic tune-up management practices for CO as a surrogate for urban organic HAP, based on GACT. Certain other subcategories (seasonal boilers, limited-use boilers, oil-fired boilers with heat input capacity of equal to or less than 5 MMBtu/hr, and boilers with an oxygen trim system) are subject to periodic tune-up work practice or management practice requirements tailored to their schedule of operation and types of fuel.

The compliance date for existing sources is March 21, 2014. The compliance date for new sources that began operations on or before May 20, 2011 is May 20, 2011. For new sources that start up after May 20, 2011, the compliance date is the date of startup. New sources are defined as sources that began operation after June 4, 2010.

Other references:

http://www.epa.gov/ttn/atw/utility/mats_rtc_chapters_foreword-1-2-3-4_121611.pdf

http://www.jonesday.com/files/Publication/0eb64603-cd11-4d83-87b4-2cd7ac323a7e/Presentation/PublicationAttachment/bee7bf81-c9e7-4a29-9057-ed02ca889908/EPA%20Proposes%20Hazardous2.pdf
Jones Day Commentary: EPA Proposes Hazardous Air Pollutant Emission Limits for Electric Generating Units

http://www.agroecol.umd.edu/files/The%20Environmental%20Concerns%20of%20Arsenic%20Additives%20in%20Poultry%20Litter%202011.05.pdf
THE ENVIRONMENTAL CONCERNS OF ARSENIC ADDITIVES IN POULTRY LITTER: LITERATURE REVIEW

http://www.epa.gov/research/annualreport/2012/ind-boilers.htm
Reducing Hazardous Air Pollutants from Industrial Boilers

http://www.takepart.com/article/2013/01/04/maryland-becomes-first-state-ban-arsenic-chicken-feed
Maryland Decides Chickens Shouldn't Eat Poison Anymore
The days of the state's putting arsenic in chicken feed are over

http://civileats.com/2012/05/25/maryland-first-state-to-ban-arsenic-in-poultry-feed/
Maryland First State to Ban Arsenic in Poultry Feed

Appendix D – Summary of Pollution Control Equipment for Biomass Fuel Burning Equipment

Overview of Air Pollution Emission Control Technologies for Biomass Boilers
Although biomass power plant operations and facilities differ from coal-fired power plant operations, they do follow the same general process to reduce emissions from the processing of biomass fuel. The following is a description of methodologies and technologies that biomass boilers employ to reduce air pollution emissions.

Description of Various Particulate Matter Control Technologies
Particulate matter (PM) in solid fuel-fired unit is formed due to the inert solids contained in the fuel, the unburned hydrocarbon fuels, as well as byproducts of limestone injection, which accumulate to form particles. Emission control technologies for the control of particulate matter in these units include electrostatic precipitators and fabric filter/baghouses.

Biomass boilers under 10MMBtu will be required to employ PM control technologies as listed below.

Electrostatic Precipitator
An electrostatic precipitator is a particle control device that uses electrical forces to remove wet or dry particles out by flowing gas stream onto collector plate. The particles are given electrical charge by forcing them to pass through a corona, a region in which gaseous ions flow. The electrical field forces the charged particles to the walls comes from electrodes maintained at high voltage in the center of the flow lane. One the particles are collected on the plates, they must be removed from the plates without re-entraining them into the gas stream. This is done by knocking them loose from the plates and allowing the collected layer to slide down into a hopper. Some electrostatic precipitators remove the particles by intermittent or continuous washing with water. Electrostatic precipitators are configured in several ways. Some of these configurations have been developed for special control action, and others have evolved for economic reasons. The types of electrostatic precipitators are plate-wire precipitator, flat plate precipitator, tubular precipitator, and two-stage precipitator.

Units using limestone injection in a dry scrubber for control of SO_x rarely use electrostatic precipitators because the use of flue gas desulfurization/baghouse combination significantly increases control of SO_x emissions while achieving comparable PM control (estimated control efficiencies range from up to 90% for $PM_{2.5}$ and up to 95% for PM_{10}). When flue gas passes through the filter cake, additional SO_x is removed by unreacted limestone and CaO in the filter cake. Also, due to the high resistivity of the PM_{10} (mostly CaO and $CaSO_3$), a fairly large electrostatic precipitators plate area would be required to match the control efficiency of baghouses, which makes electrostatic precipitators more expensive than baghouses.

Among the advantages of utilizing electrostatic precipitators are the technology can be applied to a wide variety of power and industrial applications (including biomass) and are able to tolerate still burning “sparklers” from biomass.

Costs to install an electrostatic precipitator system for biomass boilers can range from $90,000 to $350,000. Maintenance costs for this type of emission control system can range from $1,000 - $2,000.

Fabric Filter/Baghouse

A fabric filter consists of one or more isolated compartments containing rows of filter bags in the form of round, flat, or shaped tubes, or pleated cartridges. Particle-laden gas passes up along the surface of the bags then radially through the fabric. Particles are retained on the upstream face of the bags, and the cleaned gas stream is vented to the atmosphere. The filters are cyclically operated, alternating between relatively long periods of filtering and short periods of cleaning. During cleaning, dust that has accumulated on the bags is removed from the fabric surface and deposited in a hopper for subsequent disposal.

Fabric filters collect particles with sizes ranging from submicron to several hundred microns in diameter, with efficiencies in excess of 99 percent. The layer of dust or dust cake collected on the fabric is primarily responsible for such high efficiency. As the flue gas passes the filter cake additional SO_x is removed. Gas temperatures up to about 500ºF with surges to about 550ºF can be routinely accommodated in some configurations. Most of the energy used to operate the system appears as pressure drop across the bags and associated hardware and ducting. The primary disadvantage of baghouses compared to electrostatic precipitators is the higher-pressure drop across the baghouse resulting in increased fan power requirements for the system.

Total capital investment costs for a fabric filter/baghouse can range from $950,000 - $21,000,000, while annual costs can range from 1.1 to 6.5 million dollars.

Cyclones and Multicyclones

Cyclones are devices that separate particulates from the gas stream through aerodynamic/centrifugal forces. A multicyclone uses the same concept as a cyclone but employs multiple, smaller diameter cyclones to improve its capturing capacity. However, the technology is only effective in removing larger size particulates (greater than about five microns) since single and multicyclones can remove a large percentage (approximately 90%) of large particles (PM10 and larger) and remove a small percentage (less than 10%) of fine particles (PM2.5). Installation costs can range from $7,000 - $10,000 for a cyclone device, while installation costs for a multicyclone system can range from $10,000-$30,000. Annual maintenance costs for both devices are considered to be minimal.

Description of Various NOx Emission Control Technologies

Common fuel types for solid fuel-fired boilers are agricultural materials, wood residue and wood products, coke, coal, paper, tire-derived fuel, municipal solid waste, and other solid waste. NO_x emission control techniques generally fall into two categories: combustion modifications and post-combustion modifications (add-on controls). Typically, these control systems are successful in simultaneously attaining low NO_x and CO emission levels.

Small biomass boilers NOx emissions are limited through combustion design. Post combustion controls for boilers under 10MMBtu are not likely required to meet the proposed NOx standards.

Control of NO_x Emission through Combustion Modification

Low Excess Air

Low excess air is a comparatively simple and easy to implement operational measure for reducing NO_x emissions. By reducing the amount of oxygen available in the combustion zone to the minimum amount needed for complete combustion, fuel-bound nitrogen conversion and to the less extent thermal NO_x formation are reduced. There is no additional energy required for low excess air firing, and if properly operated, no reduction in availability of the power plant should result from this type of emission control technique. As the oxygen level is reduced, however, combustion may become incomplete and the amount of unburned carbon in the ash may increase. Reducing the amount of oxygen in the combustion zone in the primary zones to very low amounts can also lead to high levels of carbon monoxide. The results of such changes can be a reduction in the boiler efficiency, slagging, corrosion, and counteractive overall impact on the boiler performance. Low excess air can result in estimated control efficiencies of NO_x emissions between 16% – 20%. Investment costs vary depending on boiler size, and can range from $7,000 - $17,000 for equipment, $5,000 - $12,000 for installation, and $2,000 - $4,000 for operating and maintenance costs.

Overfire Air (Air Staging)

NO_x reduction by overfire air is based on the creation of two divided combustion zones: a primary combustion zone with a lack of oxygen, and a secondary combustion zone with excess oxygen in order to ensure complete burn-out. Overfire air reduces the amount of available oxygen (in 70 – 90% of the primary air) in the primary combustion zone. The sub-stoichiometric condition in the primary combustion zone suppresses the conversion of fuel-bound nitrogen to NO_x. In addition, the formation of thermal NO_x is reduced to some extent by resulting lower peak flame temperature. In the secondary zone, 10-30% of the combustion air is injected above the combustion zone. Combustion is completed at this increased flame volume. Therefore, the relatively low-temperature secondary stage limits the production of thermal NO_x, resulting in estimated control efficiencies between 10% - 30% of NO_x emissions. The cost effectiveness is typically in the range of $200-1,000 per ton of NO_x removed.

Flue Gas Recirculation

Flue gas recirculation significantly reduces NO_x emissions 40 to 80 percent in NO_x industrial boilers by recirculating a portion of the boiler flue gas (up to 20 percent) into the main combustion chamber. This recirculation of flue gas results in a reduction of available oxygen in the combustion zone, and since it directly cools the flame, in a decrease of the flame temperature; therefore, both fuel-bound nitrogen conversion and thermal NO_x formation are reduced. The recirculation of the flue gas into the combustion air has proven to be a successful method for NO_x abatement in combustion systems such as oil, gas, and biomass boilers. Costs to implement flue gas recirculation are significantly less than for other NO_x emission control measures such as low NO_x burners, if installing as separate unit. When combined with low NO_x burners, capital costs estimates range from $400,000 to $1,200,000 depending on boiler capacity.

Reduced Air Preheat

The combustion air preheat temperature has a significant impact on NO_x formation (estimated control efficiency of NO_x emissions of 30% -60%) mainly for gas and oil firing systems. For these fuels, the main part of NO_x is determined by thermal NO mechanism, which depends on the combustion temperature. Reducing air preheat temperature results in lower flame temperatures (peak temperatures) in the combustion zone. There are two major drawbacks of this technology. First, in several boilers, e.g., in coal burning, high combustion temperatures are required and accordingly high air preheater temperatures are essential for the proper functioning of the combustion installation. Secondly, lowering the air preheat temperature results in a higher fuel consumption, since the higher portion of the thermal energy contained in the flue gas cannot be utilized and ends up leaving the plant via the stack. This can, however, be counterbalanced by utilizing certain energy conservation methods, such as increasing the size of the economizer. Depending on unit capacity, costs for a preheated air system installation are estimated to range from $100,000 - $350,000.

Fuel Staging

Fuel staging (also called reburning) is based on the creation of different zones in the boiler by staged injection of fuel and air. The aim is to reduce back to nitrogen the nitrogen oxides that have already been formed. Fuel staging involves combustion in three zones. In the primary combustion zone, 80-85% of the fuel is burned in an oxidizing or slight reducing atmosphere. This primary burn-out zone is necessary in order to avoid the transfer of excess oxygen in the reburning zone, which would otherwise support possible NO_x formation. In the second combustion zone (often called reburning zone), secondary or reburning fuel is injected in a reducing atmosphere. Hydrocarbon radicals are produced, reacting with the nitrogen oxides already formed in the primary zone; other unwanted volatile nitrogen compounds like ammonia are generated as well. In the third zone, the combustion completes through the addition of final air into the burn-out zone. Different fuels can serve as reburning fuel (pulverized coal, fuel oil, natural gas, etc.), but natural gas is generally used due to its inherent properties. The process can result in estimated NOx emissions of 35% - 70%.

Low NO_x Burners

Low NO_x burners modify the means of introducing air and fuel to delay the mixing, reduce the availability of oxygen, and reduce the peak flame temperature. Low NO_x burners retard the conversion of fuel-bound nitrogen to NO_x and the formation of thermal NO_x, while maintaining high combustion efficiency. The pressure drop in the ducts increases, causing more operational expenses. There could also be some corrosion problems especially if the process is not properly controlled. The low NO_x burning techniques requires, at least, the burners to be changed and installation of overfire air. If existing burners are classical burners, then changing the burners can usually be done very cost-effectively. However, if the burners are delayed combustion low NO_x burners (old type), the benefits of retrofitting such burners into rapid injection low NO_x burners can only be effectively assessed on a case-by-case basis. As a stand alone emissions control system, low NO_x burners can result in estimated control efficiencies of NO_x emissions between 30% – 50%, While used in conjunction with other control systems such as overfire air or flue gas recirculation can result in control efficiencies close to 80%. The average annual cost effectiveness for low NO_x burners can range from $600 - $1,400 per ton of NO_x removed.

Control of NO_x Emission through Post Combustion Controls (Flue Gas Treatment)

Selective Non-Catalytic Reduction (SNCR)

Selective non-catalytic reduction (SNCR) involves direct injection of ammonia or urea at the flue gas temperatures of about 1600ºF to 1900ºF. Ammonia or urea reacts with NO_x in the flue gas to produce N_2 and water. The reactions in the SNCR are due to the thermal decomposition of ammonia or urea and the subsequent NO_x reduction. A simplified NO_x reduction reaction in SNCR is shown below.

Ammonia: $4NH_3 + 4NO + O_2 \rightarrow 4N_2 + 6H_2O$

Urea: $CO(NH_2)_2 + 2NO + 1/2O_2 \rightarrow 2N_2 + CO_2 + 2H_2O$

The temperature of the flue gas at the point of ammonia or urea injection and the amount of unreacted NH_3 (ammonia slip) that will pass through the SNCR can significantly affect the efficiency of NO_x reduction. At temperatures below the desired operating range, the reduction reactions diminish and ammonia slip increases. Above the desired temperature range, NH_3 is oxidized to NO_x, which results in decreased NO_x reduction efficiencies.

An important factor to the performance of SNCR is the mixing of the reactant and the flue gas within the reaction zone. Design considerations include delivering the reagent in the proper temperature window, and allowing sufficient residence time of the reagent and flue gas in the proper temperature window. Additionally, other factors such as reagent to NO_x ratio and fuel sulfur content also influence the performance and reduction efficiency of SNCR.

The U.S. EPA estimates SNCR control efficiencies of 25 – 40%, although higher control efficiencies have been reported in some cases. The use of SNCR is expected to have a total capital cost ranging from $3 to $4.5 million and an estimated total annual cost (includes operating and maintenance costs) of $1,000,000.

Selective Catalytic Reduction (SCR)

Selective catalytic reduction involves injecting ammonia into the flue gas in the presence of a catalyst to reduce NO_x to elemental nitrogen (N_2) and water. The overall SCR reactions are shown below.

$4NH_3 + 4NO + O_2 \rightarrow 4N_2 + 6\ H_2O$

$8NH_3 + 4NO_2 + O2 \rightarrow 6N_2 + 12H_2O$

Flue gas temperature, SCR inlet NO_x concentration, catalyst surface area, volume, and age of the catalyst, and acceptable amount of ammonia slip influence the performance of the SCR. The catalyst lowers the activation energy of the NO_x decomposition reaction and allows NO_x reduction to proceed at a lower temperature that is required by SNCR. Depending on the type of catalyst used, the optimal temperature range is typically between 650ºF to 800ºF. Below this temperature range ammonium sulfate can form which causes catalyst deactivation. Above the optimum temperature, the catalyst will sinter and rapidly deactivate. SCR is considered technological feasible for control of NO_x from solid fuel-fired units. Control efficiencies for installed SCR systems are as high as 90% in some cases. SCR has an estimates total annual cost (includes operating and maintenance costs) ranging from $6,000 to $8,000/ton NO_x.

Appendix E – Maryland Wood Industry Overview

Wood Fuel and Maryland's Forest Industry: Markets for Better Forest Health

Products made from wood are required by each one of us everyday, and this translates directly back to those who own forests as a tangible economic value that provides a very real incentive to keep their land in forest. Strong local markets for wood result in forest landowners investing in better management of their forests, which in turn enhances the multitude of non-timber benefits forests provide to all of us. Forests provide a natural buffer protecting the Chesapeake Bay and the tributaries that make up our unique natural environment. Forestland is the second largest land-use in Maryland, with 2.6 million acres (39% of all land)[1], supporting a major industry and underpinning the environmental well-being of our State. If our forests lose their economic value to the people who own them, then we will likely lose the forest.

Landowners who actively tend and care for their forests employ management techniques (land management planning, fertilizing, planting, thinning and harvesting) to achieve their goals of retaining a healthy forest for recreation, privacy, and satisfying their personal stewardship ethic. These management activities are sometimes costly, but if done properly will result in increased volumes of and more valuable salable products such as timber, logs, pulpwood, chips and wood fuel. These intermediate outputs are then used by manufacturers of wood products, paper products and furniture and by energy producers to create higher value products.

The forest products industry continues to be Maryland's 5th largest manufacturing industry, directly employing over 10,000 Marylanders with an annual employee compensation of $650 million.[2] Tax revenues from the sale of goods and services related to the manufacture of forest products is $26 million annually.[2] There are over 1,300 forest product manufacturing facilities in Maryland, and the forest products industry impacts every Maryland county.[3] When applying an economic multiplier, the total economic benefit of this industry is $4 billion and represents over 40,000 jobs.[4]

The profile of wood processing operations is fortunately diverse, in terms of product utilization, size, and geographic location. General examples of processing operations include local firewood providers, logging businesses, sawmills, paper manufacturing, mulch producers, architectural millwork shops, cabinetry shops, custom furniture makers, corrugated box plants, and dozens of others, all of which ultimately derive their raw materials from forests and thus facilitating the economic resources needed to carry out needed silviculture. The industry's role of importance to forestry is simply summarized by the statement "No markets, no management".

Forests provide obvious benefits to air management. Maryland's recently implemented Greenhouse Gas Reduction Plan recognizes that healthy and vigorous forests serve as the preferred land-use strategy for avoiding emissions and capturing airborne GHGs resulting in a biogenic carbon storage lasting decades if not centuries. Carbon is sequestered, or captured out of the air by living plants and trees and by employing forest management practices a forest can actively capture carbon at a higher rate than if a forest was left untended, which would result in too crowded conditions that slow growth. Science shows that actively monitoring forests and adjusting the species mix and population densities to achieve habitat and timber goals also yields increased rates of carbon dioxide sequestration in forest biomass, plus an increased amount of carbon is stored in harvested durable wood products, and these management activities also result in increased availability of renewable biomass for energy production.

Bioenergy can support forest management by offsetting some of the financial and carbon emission costs of the treatments applied to forests to keep them healthy and let them grow to their full potential. Wood used for energy purposes would be limited to the material that currently has no market, and so creating an energy market for these unutilized forestry materials would simultaneously create a new revenue stream enabling more acres of forest to be treated. This would in turn capture even more carbon from the atmosphere. Furthermore, burning wood in a tightly controlled system would provide the multiple benefits of eliminating methane produced during decay processes (the most destructive of the greenhouse gases) and the additive benefit of avoiding fossil fuel carbon emissions

Wood fuels are derived from the waste stream and residuals of other local industries. Materials are often sourced from by-products of lumber mills, furniture producers, logging sites or urban tree trimmings. Use of these byproducts can create the dual effect of providing revenue to these industries while also securing a renewable source of fuel for thermal energy needs.

Appendix F – Maryland House Bill 167 – Agricultural Feed

Chapter 652

(House Bill 167)

AN ACT concerning

Agriculture – Commercial Feed – Arsenic Prohibition

FOR the purpose of prohibiting a person from using, selling, or distributing certain commercial feed that contains roxarsone or any other additive that contains arsenic; *authorizing a person to use, sell, or distribute certain commercial feed that contains histostat;* providing for the termination of this Act under certain circumstances; requiring the State Department of Agriculture to provide a certain notification; providing for a delayed effective date; and generally relating to the contents of commercial feed.

BY adding to
Article – Agriculture
Section 6–107.3
Annotated Code of Maryland
(2007 Replacement Volume and 2011 Supplement)

SECTION 1. BE IT ENACTED BY THE GENERAL ASSEMBLY OF MARYLAND, That the Laws of Maryland read as follows:

Article – Agriculture

6–107.3.

(A) ~~A~~ ***EXCEPT AS PROVIDED IN SUBSECTION (B) OF THIS SECTION, A*** **PERSON MAY NOT USE, SELL, OR DISTRIBUTE FOR USE OR SALE WITHIN THE STATE ANY COMMERCIAL FEED INTENDED FOR USE AS POULTRY FEED THAT CONTAINS:**

(1) ROXARSONE; OR

(2) ANY OTHER ADDITIVE THAT CONTAINS ARSENIC.

(B) ***A PERSON MAY USE, SELL, OR DISTRIBUTE FOR USE OR SALE WITHIN THE STATE ANY COMMERCIAL FEED INTENDED FOR USE AS POULTRY FEED THAT CONTAINS HISTOSTAT.***

SECTION 2. AND BE IT FURTHER ENACTED, That:

(a) This Act shall be abrogated and of no further force and effect with respect to the specific arsenical additive receiving approval by the U.S. Food and Drug Administration ~~under 21 C.F.R. Part 514,~~ if the U.S. Food and Drug Administration, *on review of new information under 21 C.F.R. Part 514, issues a finding that*:

~~(1) approves the use of Roxarsone, or any other additive that contains arsenic; and~~

~~(2) finds that the exposure to Roxarsone, or any other additive that contains arsenic is:~~

~~(i) unavoidable and necessary; and~~

~~(ii) without adverse effects to the environment.~~

(1) approves the use of the arsenical additive; and

(2) includes in its approval an evaluation of:

(i) human food safety;

(ii) impact on the environment;

(iii) safety to animals;

(iv) effectiveness of the drug for its intended use; and

(v) chemistry and manufacturing procedures~~; *and*~~

~~*(vi) water quality impacts to the Chesapeake Bay; and*~~

~~*(3) exposure to the arsenical additive is unavoidable and necessary*~~.

(b) The State Department of Agriculture shall notify the Department of Legislative Services within 5 days after the action under subsection (a) of this section occurs.

SECTION ~~2.~~ 3. AND BE IT FURTHER ENACTED, That this Act shall take effect ~~October 1, 2012~~ January 1, 2013.

Approved by the Governor, May 22, 2012.

Appendix G – EPA Boiler MACT Legitimacy Criteria

The purpose of EPA's MACT Legitimacy Criteria is to clarify which materials are considered solid waste when burned in combustion units and which are not. Materials that are determined to be "not" a solid waste can be used as fuel in boilers and fuel burning equipment that follow the EPA boiler rules and proposed MDE regulations.

To be considered solid waste or not, the basic criterion is whether the material has been discarded. Discarded (or secondary) materials are generally considered solid waste. EPA addresses the issue of defining solid waste versus fuel by subjecting materials to a "legitimacy criteria" determination:

1. if the material is managed as a valuable commodity;
2. if the material has meaningful heating value (or, for a material considered an ingredient, if it makes a useful contribution to the production or manufacturing process); and
3. if the material contains contaminants at levels comparable to or lower than traditional fuels or ingredients.

This concept is important in determining whether a material is being used as a product fuel or is also being burned to destroy waste materials. That is, even if burned as a fuel, a secondary material would be a waste if contaminants are present at excessive levels. The contaminants of interest are the hazardous air pollutants (HAPs) and criteria air pollutants identified in sections 112 and 129 respectively of the CAA.

Therefore, in the case of biomass material to be combusted, once a legitimacy criteria determination has established the material to "not" be a solid waste, it can be stated that when this biomass is combusted it will emit pollutant levels comparable to or lower than traditional fuel that might have been utilized for the same purpose.

When a farm requests a permit to burn chicken litter, the litter and its handling process to be prepared to burn will have to be approved by EPA through following the Code of Federal Regulations Title 40 Part 241 (includes the Legitimacy Criteria Determination). The same process will be required for construction debris that may contain treated lumber. This process can assure the public that HAPs will be reviewed and minimized through a comparison with a traditional fuel source. A farm that requests to burn wood chips produced from wood products or scraps ("clean wood" or "resinated wood") would not be required to have legitimacy criteria determination.

EPA defines "biomass" under 40 CFR 63 Subpart JJJJJJ ICI Boilers (63.11237 What Definitions apply to this subpart?). Biomass includes a list of materials that are considered as biomass but includes the statement "This definition is not intended to suggest that these materials are or are not solid waste." The EPA definition of biomass, in combination with the legitimacy criteria, defines whether a material may be considered a fuel.

The proposed MDE definition of "Biomass" in COMAR 26.11.09.01 incorporates the federal definition and notes the legitimacy criteria process that may be required:

(1-1) "Biomass"

(a) Means solid organic material that can be combusted for use as fuel including the following:

(i) Wood residue and wood products (e.g., trees, tree stumps, tree limbs, bark, lumber, sawdust, sander dust, chips, scraps, slabs, millings, and shavings);

(ii) Animal manure, including litter and other bedding materials;

(iii) 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 prunings, corn stalks, coffee bean hulls and ground; and

(iv) Any solid organic material that has been approved by the Department, on a case-by-case basis, utilizing the criteria established by EPA and set forth in 40 C.F.R.241.3, as amended.

(b) This definition of biomass is not intended to suggest that these materials are or are not solid waste.

Under separate rulemaking EPA addresses various material compositions that may be biomass and also might be used as a fuel rather than be considered as a solid waste. Fuels and ingredients being proposed for use as a 'Biomass Fuel' will have to be approved by going through the legitimacy criteria established by EPA in the Code of Federal Regulations (CFR), Title 40, Chapter I, Supchapter I, Part 241 "Identification of Non-Hazardous Secondary Materials That are Solid Waste". Animal manure, treated lumber and other materials will need to follow the Legitimacy Criteria under 40 CFR 241.

Applicable EPA Regulations

1. March 21, 2011 Final Rule-
   40 CFR Part 241
   Identification of Non-Hazardous Secondary Materials That are Solid Waste
   EPA–HQ–RCRA 2008–0329

Quote from summary: "The Environmental Protection Agency (EPA or the Agency) is publishing a final rule that identifies which non-hazardous secondary materials, when used as fuels or ingredients in combustion units, are "solid wastes" under the Resource Conservation and Recovery Act (RCRA). This RCRA solid waste definition will determine whether a combustion unit is required to meet the emissions standards for solid waste incineration units issued under section 129 of the Clean Air Act (CAA) or the emissions standards for commercial, industrial, and institutional boilers issued under section 112 of the CAA. In this action, EPA is also finalizing a definition of traditional fuels."
http://www.regulations.gov/#!documentDetail;D=EPA-HQ-RCRA-2008-0329-1734

2. February 7, 2013 Final Rule – FR vol.78, no.26 pg 9112
   40 CFR Parts 60 and 241- Commercial and Industrial Solid Waste Incineration Units: Reconsideration and Final Amendments; Non-Hazardous Secondary Materials That are Solid Waste. (December 20, 2012 Final Rule, date signed by EPA Administrator Jackson)
   EPA–HQ–OAR–2003–0119 and EPA–HQ–RCRA 2008–0329

Quote from publication: "In addition, the EPA is issuing final amendments to the regulations that were codified by the Non-Hazardous Secondary Materials rule (NHSM

rule). Originally promulgated on March 21, 2011, the non-hazardous secondary materials rule provides the standards and procedures for identifying whether non-hazardous secondary materials are solid waste under the Resource Conservation and Recovery Act when used as fuels or ingredients in combustion units. The purpose of these amendments is to clarify several provisions in order to implement the non-hazardous secondary materials rule as the agency originally intended."
http://www.regulations.gov/#!documentDetail;D=EPA-HQ-RCRA-2008-0329-1981

3. February 1, 2013 – Final rule; notice of final action on reconsideration.FR vol.78, no.22 pg7488
   40 CFR Part 63 - National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers. (Subpart JJJJJJ)
   EPA–HQ–OAR–2006–0790

Quote from publication "In addition, the final rule sets standards based on GACT for boilers combusting oil or biomass for urban HAP, including Hg, arsenic, beryllium, cadmium, lead, chromium, manganese, nickel, POM, ethylene dioxide, and PCBs."
http://www.gpo.gov/fdsys/pkg/FR-2013-02-01/pdf/2012-31645.pdf

Poultry Manure - Fuel or Non-Hazardous Solid Waste?
Applying the Legitimacy Criteria

EPA addresses this issue under the Non-Hazardous Secondary Materials rule (NHSM rule), which provides the standards and procedures for identifying whether non-hazardous secondary materials are solid waste under the Resource Conservation and Recovery Act when used as fuels or ingredients in combustion units. 40 CFR 241.1 - .4.
Reference #1

Under NHSM, 40 CFR 241.4(a), EPA has included a list of a few materials that are not solid wastes and are approved as a fuel, and therefore able to follow the CAA Section 112 which sets standards under fuel burning equipment. This list means EPA does not need to perform a legitimacy criteria determination and that the materials when used in a combustion unit would not have to follow the CAA Section 129 which sets standards for incineration units.
Reference #2

Materials that have received a categorical non-waste determination from EPA are:

1. scrap tires that are managed under established tire collection programs;
2. resinated wood;
3. coal refuse that has been recovered from legacy piles and processed in the same manner as currently-generated coal refuse;
4. dewatered pulp and paper sludges burned on-site at facilities that use a significant portion of materials as fuels where such dewatered sludges are

managed in a manner that preserves the meaningful heating value of the materials.

Reference #3

Animal manure, treated lumber and others are not on the list of categorical non waste materials. Therefore they would be required to follow the process listed below.

No Blanket Determination that Manure is a Fuel

EPA states that "…animal manure that is used as a fuel "as generated" does not satisfy the legitimacy criteria, and thus, if combusted "as generated" would be a solid waste." EPA notes, however there are circumstances where manure would not be considered a solid waste when burned for fuel for energy recovery.

When Can Manure Be Considered a Fuel?

1. When manure remains within the control of the generator and meets the legitimacy criteria (self-implementing)
2. When manure is sufficiently processed (e.g., via anaerobic digestion or gasification processes) and the resulting material meets the legitimacy criteria (self-implementing);
3. When facility receives a determination from EPA pursuant to 40 CFR 241.3(c) stating that its manure was a non-waste when used as a fuel (need case by case approval from EPA).

Reference #3

What are the Legitimacy Criteria? (Legitimacy Criteria pursuant to §241.3(c))

1. Fuel is managed as a valuable commodity
2. Fuel has a meaningful heating value (EPA has established 5,000 Btu/lb as a benchmark for demonstrating that a NHSM has meaningful heating value). If the heating value is lower than 5,000 Btu/lb as fired, a person would need to demonstrate that the energy recovery unit can cost-effectively recover meaningful energy from the manure used as a fuel.
3. Fuel contains contaminants at levels that are comparable to or lower than those in traditional fuels. EPA further notes, in the March 21, 2011 rule, that "EPA is generally defining "comparable to or lower than" to mean hazardous secondary materials within a small acceptable range, or at lower levels, relative to the contaminants found in the traditional fuels. Thus, biofuels that are produced from non-hazardous secondary materials can have contaminants that are somewhat higher than the traditional fuel that otherwise would be burned and still qualify as being comparable, and would not be considered a solid waste."

Reference #4

<u>What is Process for Determining Manure is a Fuel?</u> (Legitimacy Criteria pursuant to §241.3(d))

1. Within the Control of the Generator (i.e.- When manure remains within the control of the generator and meets the legitimacy criteria) Can be used as a fuel or as an ingredient in a manufacturing process.

2. Processing of Manure (i.e. When manure is sufficiently processed (e.g., via anaerobic digestion or gasification processes) and the resulting material meets the legitimacy criteria to be a fuel or an ingredient)

   Per the March 21, 2011 preamble, "This is a self-implementing provision, such that a petition would not need to be submitted to EPA and is not limited to "within the control of the generator." Thus, for example, a farm or third party could process the manure to remove or destroy contaminants that are not at levels comparable to those contained in traditional fuels or improve the materials heating value, and after processing, to the extent the processed manure meets the legitimacy criteria, the processed manure would not be a solid waste when burned as a fuel for energy recovery. Also, as we discussed in the proposed rule, we expect that manure can be processed into a non-waste gaseous fuel (e.g. via anaerobic digestion or gasification processes) as suggested by commenters. This gaseous fuel would also have to satisfy the legitimacy criteria, and while we did not receive data on contaminant levels of gaseous fuels that are, or could be, produced, we generally expect that a system could be designed to produce a clean gaseous fuel that would satisfy all our legitimacy criteria."

   In a footnote, EPA states that "… processing is designed to produce or extract a product from a waste- not just to chop the waste up. However, to the extent that this level of processing is considered sufficient, the processed manure would not be a solid waste when burned in a combustion unit as a fuel for energy recovery."

3. Non-Waste Determination Petition Process (i.e. When facility receives a determination from EPA pursuant to 241.3(c) stating that its manure will be a non-waste when used as a fuel) The material that has been determined through a case-by-case petition process not to have been discarded and to be indistinguishable in all relevant aspects from a fuel product.

Reference #3

A petition to EPA requesting a non-waste determination would need to meet the following criteria:

a. Whether market participants treat the non-hazardous secondary material as a product rather than as a solid waste;
b. Whether the chemical and physical identity of the non-hazardous secondary material is comparable to commercial fuels;

c. Whether the non-hazardous secondary material will be used in a reasonable time frame given the state of the market;
d. Whether the constituents in the manure are released to the air, water, or land from the point of generation to the point just prior to combustion of the manure at levels that are comparable to what would otherwise be released from traditional fuels; and
e. Other relevant factors.

Pursuant to 241.4(b), the EPA Regional Administrator will evaluate the application and issue a draft notice tentatively granting or denying the application. Notice will be published in a newspaper or radio broadcast and on EPA's website. There will be a 30 day public comment period and a hearing may be held at the discretion of the EPA Regional Administrator.
Reference #4

<u>EPA Example Poultry Litter Determination</u>
EPA has published an example letter of determination for a farm that proposed to us poultry litter as a fuel on the EPA's NHSM webpage. The poultry litter has been determined to be a non solid waste, therefore acceptable as fuel. *Reference #3*

<u>Material Characterization Papers</u>
In order to simplify the review of various types of materials that could be biomass, EPA has posted a list of Material Characterization papers on the EPA's NHSM webpage. A few in the list are;
Biomass – Animal Manure and Gaseous Fuel.
Construction and Demolition Materials – Building Related C&D (includes treated wood reference)
Auto Shedder Residue, plus others.
These Material Characterization papers help to describe a group of materials that may request to be burned as a non-traditional fuel. A review of a traditional fuel source verses example test data is noted in the paper and can be utilized when a state fuel burning application is made.
Reference #4

<u>Treated Lumber - Fuel or Non-Hazardous Solid Waste?</u>
<u>Applying the Legitimacy Criteria</u>

The Material Characterization "Construction and Demolition Materials – Building Related C&D" paper indicates that treated lumber may be reviewed as part of demolition materials that may be proposed to be used as a biomass fuel. The same steps that have been detailed for Poultry Manure would apply to this category as a case by case EPA determination.

The C&D paper does not determine if the treated lumber is a solid waste or not, it is a guideline for the characterization of the material and details comparison fuels. The paper has the following quotes:

"Building-related construction debris and demolition (C&D) materials are commonly grouped as a single type of material, despite the fact that these two material streams come from different processes."
"Debris from this process is often painted or chemically treated or is fastened to other materials, making separation difficult (NESCAUM 2006). For the purposes of this summary, wooden railroad crossties and wooden utility poles are also characterized as demolition materials."
Reference #4

<u>Environmental Justice Review February 2011</u>

Summary data quoted from the document.
"This section summarizes the environmental justice (EJ) impacts of the following rules: (1) the Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Commercial and Industrial Solid Waste Incineration (CISWI) Units (the CISWI Rule); (2) the National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers (the area source Boilers Rule); (3) the National Emission Standards for Hazardous Air Pollutants for Industrial/Commercial/Institutional Boilers and Process Heaters (the major source Boilers Rule); and (4) the Identification of Non-hazardous Secondary Materials that are Solid Waste (the NHSM rule). Presenting the EJ impacts of each of these rules individually would be complicated, and could be misleading by the fact that the four rules are interdependent. For example, the emissions standards included in the three air rules are contingent on which non-hazardous secondary materials are considered solid waste, and changes in the way that combustion units manage non-hazardous secondary materials will depend on the costs of the various emissions standards. Thus, this document provides a combined EJ assessment for all four rules.

EJ impacts that may result from the four rules are likely to be related to the following:
• Emissions from regulated combustion units
• Emissions from the diversion of non-hazardous secondary materials from their current fuel or ingredient use applications to disposal or other beneficial uses.
• Other impacts related to material diversion (e.g., noise, aesthetics, water pollution, etc.)
In addition, whether the rules result in adverse and disproportionate impacts to low-income and minority populations will depend on the demographic characteristics of areas experiencing changes in environmental effects.

Based on our assessment of the emissions changes and other environmental impacts of the rules and the demographics of populations near affected combustion units and waste management facilities, our main conclusions with respect to the EJ impacts of the rules are as follows:

• ***Emissions changes from affected combustion units are unlikely to lead to adverse and disproportionate impacts for low-income and minority populations:*** Because emissions from facilities burning non-hazardous secondary materials will decline as a result of the rules, populations near these facilities will likely experience positive impacts (e.g., reduced incidence of adverse health effects). The demographic data for the Census blocks near these facilities suggest that low-income and minority populations are higher than the national average in these areas in proportional terms.

• ***Increases in emissions associated with the diversion of non-hazardous secondary materials away from their current fuel or ingredient uses are minimal compared to the emissions reductions resulting from the rules. Thus, in net terms, the emissions impacts of the rules are unlikely to lead to adverse and disproportionate impacts for low-income and minority populations:*** The diversion of non-hazardous secondary materials from their current fuel and ingredient applications to disposal may lead to emissions increases (e.g., from the production of virgin fuels or ingredients), but these increases are minimal relative to the reductions achieved due to the Boiler MACT and CISWI controls. Therefore, low-income and minority populations are expected to benefit from the overall emissions reductions expected under the rules.

• ***Low-income and minority populations located near waste management facilities (not including boilers) are disproportionately high relative to the national average:*** Our analysis of the demographic characteristics of populations within three miles of these facilities suggests that they are located in areas with high minority and low-income populations. To the extent that non-hazardous secondary materials are defined as solid wastes, those materials that are currently burned in combustion units as either a fuel or ingredient may no longer be burned in such units, but may be sent to waste management facilities for disposal or recycling. Therefore, to the extent that such material diversion leads to adverse environmental impacts at these facilities, which is uncertain and will vary by material and facility type, low-income and minority populations could be disproportionately impacted."
Reference #5

Reference List

#1. 40 CFR 241
http://www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR&searchPath=Title+40%2FChapter+I%2FSubchapter+I%2FPart+241&oldPath=Title+40%2FChapter+I%2FSubchapter+I%2FPart+241&isCollapsed=true&selectedYearFrom=2013&ycord=1828 downloaded 10-03-13

#2. EPA finalizes clean air standards for industrial boilers, and certain incinerators, and non-hazardous secondary materials definition.
http://www.epa.gov/airquality/combustion/actions.html downloaded 10-03-13

#3. EPA webapge Non-Hazardous Secondary Material Rulemakings
http://www.epa.gov/epawaste/nonhaz/define/index.htm#cc downloaded 10-03-13

#4. EPA webpage Identification of Non-Hazardous Secondary Materials That Are Solid Waste http://www.epa.gov/epawaste/nonhaz/define/rulemaking.htm downloaded 10-03-13

#5. Environmental Justice Review February 2011
http://www.regulations.gov/#!documentDetail;D=EPA-HQ-RCRA-2008-0329-1834
downloaded 10-04-13

Appendix H - Maryland Department of the Environment - Best Available Control Technology (BACT) Analysis for Biomass Boilers

EPA, through the MACT/GACT development process for biomass boilers determined that for boilers less than 10 MMBtu/hr heat input capacity (small), national numerical emission limits were not economically feasible. As a result, EPA's finalized rules (40 CFR 63 Subpart DDDDD National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters) and (40 CFR Part 63 Subpart JJJJJ, National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers) only applied GACT standards to boilers less than 10 MMBtu/hr heat input. Under GACT, optimization of boilers and best operating practices are required. The federal standards, as written under NESHAP, did not establish NOx emission standards for any size boiler under the aforementioned rules. New Source Performance Standards (NSPS) EPA 40 CFR 60 Subpart D, Db & Dc set NOx standards to apply for sources that contribute to a facility classified as Major Source. At that time, biomass was not defined for the NSPS.

To be more protective of the federal national ambient air quality standards, the Maryland Department of the Environment (MDE) proposed to set BACT standards that would establish PM emission standards for boilers less than 10 MMBtu/hr heat input capacity and NOx emission standards for all biomass boilers. MDE's BACT analysis for biomass boilers was conducted as follows:

1.) Detailed analysis of state biomass standards and performance data was collected from NH, VA, DE, CA, CT, MA, VT, NJ and PA. Analysis of EPA biomass data for the Boiler MACT was reviewed. Performance of existing larger wood biomass boilers in Maryland were reviewed.

2.) Stakeholder comments and performance data was provided by the Maryland Wood Energy Coalition, the Biomass Thermal Energy Council and Sustainable Chesapeake. Stakeholder conversations were held with the Maryland Energy Administration and the Department of Natural Resources.

3.) Data was collected from national combustion equipment manufacturers and from control equipment manufacturers for performance and cost.

4.) Conducted a site visit, organized by Maryland Wood Energy Council, of five facilities utilizing recently installed smaller biomass boilers in PA.

5.) Maryland's inspection, permitting and operational experience with technology applications for biomass fuel was also included in the analysis and development of BACT standards.

Section 169 Definitions (3) of the federal Clean Air Act (Part C - PREVENTION OF SIGNIFICANT DETERIORATION OF AIR QUALITY, Subpart 1) defines BACT as follows:

> "The term "best available control technology" means an emission limitation based on the maximum degree of reduction of each pollutant subject to regulation under this Act emitted from or which results from any major emitting facility, which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility through application of production processes and available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of each such pollutant. In no event shall application of "best available control technology" result in emissions of any pollutant which will exceed the emissions allowed by any applicable standard established pursuant to section 111 or 112 of this Act. Emissions from any source utilizing clean fuels, or any other means, to comply with this paragraph shall not be allowed to increase above levels that would have been required under this paragraph as it existed prior to enactment of the federal Clean Air Act Amendments of 1990."

The EPA and MDE definition of biomass includes a wide variety of materials (that can be used as fuel) provided below:

(i) Wood residue and wood products (e.g., trees, tree stumps, tree limbs, bark, lumber, sawdust, sander dust, chips, scraps, slabs, millings, and shavings);

(ii) Animal manure, including litter and other bedding materials;

(iii) 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 prunings, corn stalks, coffee bean hulls and ground; and

(iv) Any solid organic material that has been approved by the Department, on a case-by-case basis, utilizing the criteria established by EPA and set forth in 40 C.F.R.241.3, as amended. This definition of biomass is not intended to suggest that these materials are or are not solid waste.

Biomass is non – homogeneous fuel and in BACT determinations the availability of fuel with lower transportation costs plays a critical role. To take these factors into account, special emphasis was given to the results and developments with respect to BACT in neighboring states. Biomass fuel composition plays a critical role in the design and development of a combustion system. Fuel monitoring requirements and adherence to manufacturer's specifications are necessary to ensure optimum performance. Data on performance results was gathered as stated above from neighboring states, other states in the region and nationally. The process of implementing BACT regionally and nationally has led to significant technology improvements in performance of combustion systems over a long period of time and is reflected in the standards and requirements under EPA MACT/GACT.

Maryland specifically set an emission limit for PM and NOx from 30 stack test results compiled for boilers under 30 MMBtu/hr. The BACT determination utilized input from the following states; NH, VA, DE, CA, CT, MA, VT, NJ, RI and PA. The majority of the other states reviewed have wood chips or wood products as a biomass fuel. MDE has proposed standards that will address a broad range of biomass products as defined by the proposed regulations and EPA, which therefore takes into account the non-homogenous characteristics of biomass.

Table 1 details the emissions data collected for the BACT analysis. The emissions data collected was in the following range for units of different sizes. Many units analyzed were installed and tested using biomass in the form of clean wood chips. However, some of the testing included vegetative agriculture, such as switch grass, wood pellets and other wood by-product composition. MDE's research and stakeholder outreach found that poultry litter applications seem most suitable to on-site farm heating needs.

The typical size range from 0.5 to 1.5 MMBtu/hr has been proposed to utilize poultry litter, and detailed combustion technology is under development in DE, MD and VA. Due to the non-homogenous characteristics of poultry litter biomass, it's thermal heat value and efficiency a separate category of emission rates was established for boilers less than 1.5 MMBtu/hr heat input. As units are developed and permits requested, manufacturing testing will be closely monitored by MDE for future developments.

For small size boilers less than 1.5 MMBtu/hr heat input rate the research and development project data from the equipment manufacturer of test and application results was used in the BACT analysis. The energy recovery initiative research has been conducted by Sustainable Chesapeake. Table 2 details the emission data for units under 1.5 MMBtu/hr.

The cost information used in the BACT analysis is provided below in Table 3

Table1. – BACT analysis emission range for biomass boilers under 30MMBtu/hr

Emissions Analysis	
Pollutant	**Range Lbs/MMBtu**
PM	0.06 – 0.67
NOx	0.16 – 0.42

Table 2 – Poultry litter biomass pilot tests under 1.5 MMBtu/hr

Emissions Analysis	
Pollutant	**Test Value Lbs/MMBtu**
PM	0.36
NOx	0.30

Table 3 - BACT analysis economic data

Boiler Size MMBtu/hr	PM Emissions Range lb/MMBtu	NOx Emissions Range lb/MMBtu	Capital Cost Range (From Lowest to Highest Related to Emissions)	Cost for Controls Range	Operating Cost Range (From Lowest to Highest Related to Emissions)
2	0.2 or less	0.2-0.3	\$350,000-\$410,000	\$10,000-\$15,000 single cyclone	Lowest cost. Induced draft fan part of the system design.
10	0.2 or less	0.2-0.3	\$650,000-\$725,000	\$15,000-\$25,000 multi-cyclone	Lowest cost. Induced draft fan part of the system design.
20	0.03 or less	0.2-0.3	\$1-1.25 Million	\$220,000-\$300,000 ESP	Higher cost vs multi-cyclone due to electrical usage of the ESP. Cost scale up as size of plant increases.
30	0.03 or less	0.2-0.3	\$4-6 Million	\$450,000-\$550,000 ESP	Higher cost vs multi-cyclone due to electrical usage of the ESP. Cost scale up as size of plant increases.

The control equipment that can be utilized by a biomass boiler is described in Appendix C - Summary of pollution control equipment for biomass fuel burning equipment, including; single cyclone, multi-cyclone and ESP.

The results of the BACT analysis are consistent with BACT determinations in the region. This has been confirmed by the BACT standards being applied in the most recent regional state permits issued in the period 2011-13. Also the 2009 report, Biomass Boiler and Safety Furnace Emissions and Safety Regulations in the Northeast by NESCAUM also confirms similar analysis results.

A review of state regulations and policies indicates that each state throughout the mid-Atlantic and northeast addresses wood or biomass units under 10MMBtu differently. Some states have established permit requirements or a BACT process whereas others have set emission rates. What is certain is that the small wood boilers designed today utilize state of the art pollution control equipment for PM that was not economically or technically feasible only a decade ago.

Many non-traditional biomass materials are being investigated and improved for use while meeting protective air quality standards. Many biomass boiler applications may have multi-environmental benefits, such as here in Maryland with the nutrient runoff from agriculture playing a significant role in the health of the Chesapeake Bay.

Table 4 – MDE proposed standards based on BACT

Biomass Fuel-Burning Equipment		
MDE	**NOx Lbs/MMBtu**	**PM Lbs/MMBtu**
30 MMBtu/hr – 1.5 MMBtu/hr heat input Area I, II, V, VI Area III & IV	0.25-0.30	0.1-0.2
Boilers less than 1.5 MMBtu/hr to 0.35 MMBtu/hr heat input Area I, II, V, VI Area III & IV	0.30	0.10 - 0.35

The wide variation in emissions data ranges that were reviewed can be attributed to the non-homogenous characteristics of the fuel, variations in the combustion process that is directly dependent upon the boiler design and configuration. As can be seen from the definition of biomass, a large variety of materials are included which may result in significant differences in combustion properties. In developing the BACT standards for small boilers, consideration was given to the standards being applied consistently for efficient boiler designs in regional permits. Cost analysis was conducted for the range of standards under consideration. MDE has specified emission limits that various compositions of biomass can meet, with the guarantee of the manufacturers. The actual emissions and verifications should reveal actual performance below the rates in the regulation.

The range of standards was reviewed by manufacturers, Maryland Wood Energy Council, and the Bio Thermal Energy Council. Maryland's Wood Energy Council conducted tours of biomass boiler applications and conducted reviews of data. Operational, permitting and compliance expertise in Maryland were utilized in the review process. Published data and reports were also used to differentiate the standards. The stakeholder process helped improve and confirm the development process as it brought together the best practices and standards for biomass fuel burning equipment.

A	1/13/2013	78 FR 7193	40 CFR 63	Subpart DDDDD	Table 1	New Boilers and process heaters
B	1/13/2013	78 FR 7195	40 CFR 63	Subpart DDDDD	Table 2	Existing boilers and process heaters
C	1/13/2013	78 FR 7206	40 CFR 63	Subpart DDDDD	Table 11	Existing boilers and process heaters
D	1/31/2013	78 FR 7208	40 CFR 63	Subpart DDDDD	Table 12	Existing boilers and process heaters
E	1/31/2013	78 FR 7211	40 CFR 63	Subpart DDDDD	Table 13	New Boilers and process heaters
F	2/1/2013	78 FR 7517	40 CFR 63	Subpart JJJJJJ	Table 1	new, coal, biomas, oil fired
F-1	12/113/1984	consent order	MDE/ARMA	< 13 MMBtu/hr		solid fule buring equipment
F-2	5/3/1974	consent order	MDE/ARMA	15 MMBtu/hr		coal fired boiler
G	6/26/1978	consent order	MDE/ARMA	25 MMBtu/hr		coal/oil fired boiler
H	7/1/2011	PM and Nox emissions	40 CFR 60	Subpart Da		Steam generating EGU, after 1978
I	7/1/2011	PM and Nox emissions	40 CFR 60	Subpart Db		Steam generating EGU, >100 MMBtu/hr
J	7/1/2011	PM emissions	40 CFR 60	Subpart Dc		ICI steam generating units, 10<x<100 MMBtu/hr
K	no date	NA NSR apporval	MDE/ARMA	1500 ton/day		waste to energy, Frederick, MD
L	7/10/2012	emission results	Wood Education and Resource Center	< 18.5 MMBtu/hr		school/hospital wood fueled units
M	1/30/2013	COMAR 26.11.09	MDE/ARMA			fuel burning equipment
N	11/26/2012	COMAR 26.11.08	MDE/ARMA			large MWC
O	9/1/2003	AP-42	External Combustion Sources		Table 1.6-1, -2	wood residue combustion in boilers
P	2/7/2013	78 FR 9191	40 CFR 60	Subpart CCCC	Table 5, 6, 7	CISWI, after 11/30/1999
Q	2/7/2013	78 FR 9208	40 CFR 60	Subpart DDDD	Table 6, 7, 8	CISWI, before 11/30/1999
R	1/30/2013	e-mail attachment	A&H Emission Testing LLC		Pmfilt, PM10filt, No	Example Facility and Bio-mass (wood) boiler in PA
S	1/30/2013	e-mail attachment	A&H Emission Testing LLC		Pmfilt, PM10filt, No	Example Facility and Bio-mass (wood) boiler in PA
T	1/20/2005	Proposal for PM emission	Vermont Agency of Natural Resources	Scientific Information Stateme	Attachment B	wood chips emissions, lb/MMBtu
U	2/12/2009	Emissions Calculations	Verenium Biofuels Corp	Biomass Boilers		BACT emission rate, maximum
V	12/27/2007	PM and Nox emissions	Eastern Correction Institution		Table 2, 3	stack testing
W	12/30/2002	PM and Nox emissions	Eastern Correction Institution		Table 2-1	stack testing
X	5/16/1989	PM and Nox emissions	Eastern Correction Institution		Lab reports	stack testing
Y	3/4/2009	PM and Nox emissions	Ponaganset Middle School	Rhode Island	Lab reports	wood fired boiler exhaust, wood chips
Z	2010	PM and Nox emissions	Washington State DNR	Forest Biomass and Air Emiss	controlled and unco	comparison between wood, coal, nat gas, slash and burn
Aa	2012	Component and system Gu	Hurst Boiler and Welding Co.	solid fuel/biomass energy syst	no data	component and system guide
Ab	5/1/2010	AP-42	Fuel Oil Combustion		not reviewed at this time	
Ac	7/1/1998	AP-42	Natural gas combustion		not reviewed at this time	
Ad	2/28/2013	Mario Cora	Propane, Poultry litter, wood		not used	time related emissions, not energy/power
Ae	3/11/2013	e-mail attachment	Deleware regulations	1104 PM emissions		time related emissions, not energy/power
Af	3/6/2012	Comar 26.11.06	MDE/ARMA	PM emissions		general emission standards
Ag	11/12/2010	COMAR 26.11.08	MDE/ARMA	PM, Nox emissions		Incinerator, CSW and HMIWI
Ah	11/12/2010	COMAR 26.11.10	MDE/ARMA	PM emissions		Iron and steel production installations
Ai	11/12/2010	COMAR 26.11.11	MDE/ARMA	PM emissions		Asphalt paving
Aj	11/12/2010	COMAR 26.11.14	MDE/ARMA	Nox emissions		Kraft pulp mills
Ak	11/12/2010	COMAR 26.11.25	MDE/ARMA	PM emissions		glass melting furnaces
Al	11/12/2010	COMAR 26.11.29	MDE/ARMA	Nox emissions		cement, nat gas pipeline compression staations
Am	6/13/2011	COMAR 26.11.36	MDE/ARMA	Nox emissions		distributed generation
An	2/7/2013	78 FR 9111	40 CFR 60 and 241	definitions		CISWI definitions
Ao	2/12/2013	78 FR 10005	40 CFR 60 and 63	cement kilns emissions		reference to Lehigh, biosolids
Ap	12/23/2011	76 FR 80452	40 CFR 241	definitions		Clean Cellulosic Biomass

Aq	3/21/2011	76 FR 15456	40 CFR 241	non-hazardous secondary material		Identification of NHSM used as fule in Combustion unit
Ar	5/18/2011	76 FR 28662	40 CFR 60 and 63	ICI boilers, CISWI		delay of effective date
As	10/9/1991	56 FR 51015	40 CFR 258	definitions		original definitions for sludge, solid waste
At		Annotated Code of MD	Environmental	definitions		solid waste
Au		Annotated Code of MD	public utilities	definitions		biomass, poultry litter, renewable energy source, wood and plant derived biomass system
Av	6/1/2010	PM and Nox emissions	Business Park, Ireland	poultry litter, 200 Kw		stack testing, results reported in mg/m3 and lb/hr
Aw	1/22/2010	HAP emission program	Business Park, Ireland	biomass		dioxin and O2, details of testing
Ax	1/22/2013	MDE power point	Biomass to energy conversion			limited information on the source of the data
Ay		VT power point	biomass emissions and permit	Steven Snook		summary - would need further documentation
Az		EPA Fact Sheet	Boiler Standards	DOE, USDA		summary of DDDDD (major) and JJJJJJ (area)
Ba	2/21/2013	Farm Manure to Energy	manure, poultry litter	40 CFR 241, CSWI, NHSM		performance of small units, no emission stnds
Bb		EPA Fact Sheet	Biosolids	40 CFR 503		sewage as fuel, applied to Lehigh 013-00012
Bc	12/5/2012	Wood Energy Coalition	woody biomass	Maryland group		creation of RECs
Bd	2/7/2013	78 FR 9111	40 CFR 60 and 241	EPA processing criteria		EPA treatment of wood/manure as NHSM
Be	2/1/2013	Karen Irons	notes on Chicken Litter			reference to legitimacy criteria
Bf	2/8/2013	house bill 1084	public utilities	revisions		changes for wood and plant derived biomass
Bg		Wayne demo	farm in Wicomico County, MD	Global refuel system		500,000 BTU/hr, poultry litter
Bh	1/1/2012	ECI Biogas Facility	Somerset County, Maryland	thermophilic dry co-digestion		poultry litter with energy and cover crops, anaerobic, SI ICE, electricity, 40 CFR 60 JJJJ
Bi	6/1/2009	MA study/evaluation	biomass boiler & furnace emissions	RE: NSPS and NESHAP		general inforation on lab method and controls
Bj	3/11/2013	Gasification	Wikipedia			description of gasification
Bk	6/1/2005	CA collaborative report	Biomass in CA:			emission from wood ≠ agriculture
Bl	1/1/1995	AP-42	External Combustion Sources			includes steam/EGU, boilers, combustion units
Bm	11/1/2012	MA 2011 symposium	biomass, heat & Power			definitions, state emissions, emission rates
Bn		COMAR 26.11.09.08	installation	existing format, 4/5/2013	B	major source installation
Bo		COMAR 26.11.09.08	fuel buring equipment	existing format, 4/5/2013	C	>250 MMBtu/hr
Bp		COMAR 26.11.09.08		existing format, 4/5/2013	D	100 < X <250 MMBtu/hr
Bq		COMAR 26.11.09.09		existing format, 4/5/2013		dust collector performance
Br		COMAR 26.11.09.11	small wood boilers	existing format, 4/5/2013		
Bs		unknown	Method 5?	calculations for lb/MMBtu		calculations for lb/MMBtu
Bt	3/15/2013	DE operating permit	poultry litter furnace	operating parameters		Nox, PM emissions

	A	B	D	E	F	G	H	I	J	K
3	MDE		size		1/9/2014	KMW				
4										
5										
6										
7		hp	mW	MMBtu/hr	equipment		fuel	fuel 1	fuel 2	controls/others
8	**Colum**	**Colum**	**Column4**	**Column5**	**Column6**	**Column7**	**Column8**	**blank = biomass - wood**	**biomass = biomass + wood**	**Column10**
9										
10	A			>10	dutch ovens	boiler	biomass/biobased solids		biomass	
11	A			>10	units	boiler	coal/solid fossil fuel	coal/solid	coal/solid	
12	A			>10	units	boiler	heavy liquid fuel	liquid	liquid	
13	A			>10	units	boiler	light liquid fuel	liquid	liquid	
14	A			>10	fluidized bed	boiler	biomass/biobased solids		biomass	
15	A			>10	fuel cell units	boiler	biomass/biobased solids		biomass	
16	A			>10	hybird suspension	boiler	biomass/biobased solids		biomass	
17	A			>10	stokers	boiler	kiln-dried biomass		biomass, dry	
18	A			>10	stokers	boiler	wet biomass fuel		biomass, wet	
19	A			>10	suspension burners	boiler	biomass/biobased solids		biomass	
20	Af				confined sources	other	undefined	other	other	
21	Ag				HMIWI	CISWI	hazard waste	waste	waste	<200 lbs/hour
22	Ag				HMIWI	CISWI	hazard waste	waste	waste	200<x<500 lbs/hour
23	Ag				HMIWI	CISWI	hazard waste	waste	waste	>500 lb/hour
24	Ag				HMIWI	CISWI	hazard waste	waste	waste	<2000 lbs/week
25	Ag				HMIWI	CISWI	hazard waste	waste	waste	<200 lbs/hour
26	Ag				HMIWI	CISWI	hazard waste	waste	waste	200<x<500 lbs/hour
27	Ag				HMIWI	CISWI	hazard waste	waste	waste	>500 lb/hour
28	Ag				HMIWI	CISWI	hazard waste	waste	waste	<200 lbs/hour
29	Ag				HMIWI	CISWI	hazard waste	waste	waste	200<x<500 lbs/hour
30	Ag				HMIWI	CISWI	hazard waste	waste	waste	>500 lb/hour
31	Ag				HMIWI	CISWI	hazard waste	waste	waste	<2000 lbs/week
32	Ag				HMIWI	CISWI	hazard waste	waste	waste	<2000 lbs/week
33	Ag				incinerator	CISWI	municipal solid waste	waste	waste	<200 lbs/hour
34	Ag				incinerator	CISWI	municipal solid waste	waste	waste	>200 lbs/hours
35	Ag				incinerator	CISWI	undefined	waste	waste	
36	Ag				incinerator	CISWI	hazardous waste	waste	waste	
37	Ag				incinerator	CISWI	municipal solid waste	waste	waste	>250 tons/day
38	Ag				incinerator	CISWI	municipal solid waste	waste	waste	
39	Ah				iron/steel production	other	confined	other	other	
40	Ai				asphalt concrete plant	other		other	other	
41	Aj				Kraft Pulp Mills	other		other	other	>250 MMBtu/hr
42	Al	>2400			ICE at Nat Gas Pipeline	ICE	undefined	liquid	liquid	spark ingintion rich burn
43	Al	>2400			ICE at Nat Gas Pipeline	ICE	undefined	liquid	liquid	spark ingintion rich burn
44	Al	>3100			ICE at Nat Gas Pipeline	ICE	undefined	liquid	liquid	diesel engines
45	Al	>4400			ICE at Nat Gas Pipeline	ICE	undefined	liquid	liquid	dual fuel engines
46	Am				generator	ICE	NOT nat gas, propane	liquid	liquid	
47	B			>10	units	boiler	heavy liquid fuel	liquid	liquid	
48	B			>10	units	boiler	coal/solid fossil fuel	coal/solid	coal/solid	
49	B			>10	units	boiler	light liquid fuel	liquid	liquid	
50	B			>10	fuel cell units	boiler	biomass/biobased solids		biomass	
51	B			>10	stokers	boiler	wet biomass fuel		biomass, wet	
52	B			>10	suspension burners	boiler	biomass/biobased solids		biomass	

	A	B	D	E	F	G	H	I	J	K
3	MDE		size		1/9/2014	KMW				
4										
5										
6										
7		hp	mW	MMBtu/hr	equipment		fuel	fuel 1	fuel 2	controls/others
8	**Colum**	**Colum**	**Column4**	**Column5**	**Column6**	**Column7**	**Column8**	**blank = biomass - wood**	**biomass = biomass + wood**	**Column10**
53	B			>10	fluidized bed	boiler	biomass/biobased solids		biomass	
54	B			>10	dutch ovens	boiler	biomass/biobased solids		biomass	
55	B			>10	stokers	boiler	kiln-dried biomass		biomass, dry	
56	B			>10	hybird suspension	boiler	biomass/biobased solids		biomass	
57	Bh	<500			SI ICE	ICE	landfill/digester gas	gaseous	gaseous	
58	Bh	>500			SI ICE	ICE	landfill/digester gas	gaseous	gaseous	
59	Bk				open fire	other	tree prunings	wood, wood pellets, wood debris	biomass	
60	Bk				open fire	other	agricultural field crops	wood, wood pellets, wood debris	biomass	
61	Bm			<10	biomass	boiler	biomass		biomass	ESP
62	Bm			0.1	boiler	boiler	#2 ULSD	liquid	liquid	
63	Bm			0.5	2-stage boiler	boiler	wood pellets	wood, wood pellets, wood debris	biomass, dry	5% moisture
64	Bm			0.5	2-stage boiler	boiler	wood chip	wood, wood pellets, wood debris	biomass, wet	30% moisture
65	Bm			1.5	boiler	boiler	#6 heating oil	liquid	liquid	
66	Bm			4.3	boiler	boiler	#2 oil	liquid	liquid	
67	Bm			1.7	2-stage boiler	boiler	wood pellets	wood, wood pellets, wood debris	biomass, dry	5% moisture
68	Bm			7	stokers	boiler	debarked wood chips	wood, wood pellets, wood debris	biomass, wet	40% moisture
69	Bm			7	stokers	boiler	bole chips (with bark)	wood, wood pellets, wood debris	biomass, wet	40% moisture
70	Bm			<10	biomass	boiler	biomass		biomass	
71	Bm			<10	biomass	boiler	biomass		biomass	High efficincy multi cyclon
72	Bm			<10	biomass	boiler	biomass		biomass	multicyclone
73	Bm			<10	biomass	boiler	biomass		biomass	
74	Bn				major source/installation		gas	gaseous	gaseous	tangentially fired
75	Bn				major source/installation		gas	gaseous	gaseous	wall fired
76	Bn				major source/installation		gas/oil	gaseous	gaseous, liquid	tangentially fired
77	Bn				major source/installation		gas/oil	gaseous	gaseous, liquid	wall fired
78	Bn				major source/installation		coal, dry bottom	coal/solid	coal/solid	tangentially fired
79	Bn				major source/installation		coal, dry bottom	coal/solid	coal/solid	wall fired
80	Bn				major source/installation		coal, wet bottom	coal/solid	coal/solid	tangentially fired
81	Bn				major source/installation		coal, wet bottom	coal/solid	coal/solid	wall fired
82	Bo			>250	installation	EGU	gas/oil	gaseous	gaseous, liquid	
83	Bo			>250	installation	EGU	coal	coal/solid	coal/solid	tangentially fired
84	Bo			>250	installation	EGU	coal	coal/solid	coal/solid	wall fired
85	Bo			>250	cell burners-EGU	cell burner	coal	coal/solid	coal/solid	
86	Bo			>250	installation	EGU	coal	coal/solid	coal/solid	cyclone
87	Bo			>250	installation	EGU	coal	coal/solid	coal/solid	tangentially fired, high heat
88	Bo			>250	installation	other	undefined	other	other	
89	Bo			>250	installation	EGU	coal	coal/solid	coal/solid	wall fired, high heat
90	Bo			>250	installation	other	undefined	other	other	
91	Bo			>250	installation	EGU	coal	coal/solid	coal/solid	cyclone
92	Bp			100 < x <250			gas	gaseous	gaseous	tangentially fired
93	Bp			100 < x <250			gas	gaseous	gaseous	wall fired
94	Bp			100 < x <250			gas/oil	gaseous	gaseous, liquid	tangentially fired
95	Bp			100 < x <250			gas/oil	gaseous	gaseous, liquid	wall fired
96	Bp			100 < x <250			coal, dry bottom	coal/solid	coal/solid	tangentially fired

	A	B	D	E	F	G	H	I	J	K
3	MDE		size		1/9/2014	KMW				
4										
5										
6										
7		hp	mW	MMBtu/hr	equipment		fuel	fuel 1	fuel 2	controls/others
8	**Colum**	**Columr**	**Column4**	**Column5**	**Column6**	**Column7**	**Column8**	**blank = biomass - wood**	**biomass = biomass + wood**	**Column10**
97	Bp			100 < x <250			coal, dry bottom	coal/solid	coal/solid	wall fired
98	Bp			100 < x <250		other	coal	coal/solid	coal/solid	
99	Bp			100 < x <250			coal, wet bottom	coal/solid	coal/solid	tangentially fired
100	Bp			100 < x <250			coal, wet bottom	coal/solid	coal/solid	wall fired
101	Bq			<13			residual oil	liquid	liquid	
102	Bq			<250			solid fuel	coal/solid	coal/solid	
103	Bq			<250			solid fuel	coal/solid	coal/solid	
104	Bq			>250			solid fuel	coal/solid	coal/solid	
105	Bq			>250			residual oil	liquid	liquid	
106	Bq			>250			residual oil	liquid	liquid	
107	Bq			13<x<50			residual oil	liquid	liquid	
108	Bq			50<x<250			residual oil	liquid	liquid	
109	Br							blank not biomass		
110	Br			<0.35	wood fired boiler	boiler	wood, pellets	wood, wood pellets, wood debris	biomass	
111	Bt			0.5	poultry litter furnace	boiler	poultry litter		biomass	
112	C			>10	dutch ovens	boiler	biomass/biobased solids		biomass	
113	C			>10	fluidized bed	boiler	biomass/biobased solids		biomass	
114	C			>10	fuel cell units	boiler	biomass/biobased solids		biomass	
115	C			>10	hybird suspension	boiler	biomass/biobased solids		biomass	
116	C			>10	stokers	boiler	kiln-dried biomass		biomass, dry	
117	C			>10	stokers	boiler	wet biomass fuel		biomass, wet	
118	C			>10	suspension burners	boiler	biomass/biobased solids		biomass	
119	C			>10	units	boiler	heavy liquid fuel	liquid	liquid	
120	C			>10	units	boiler	light liquid fuel	liquid	liquid	
121	C			>10	units	boiler	coal/solid fossil fuel	coal/solid	coal/solid	
122	D			>10	dutch ovens	boiler	biomass/biobased solids		biomass	
123	D			>10	fluidized bed	boiler	biomass/biobased solids		biomass	
124	D			>10	fuel cell units	boiler	biomass/biobased solids		biomass	
125	D			>10	hybird suspension	boiler	biomass/biobased solids		biomass	
126	D			>10	stokers	boiler	kiln-dried biomass		biomass, dry	
127	D			>10	stokers	boiler	wet biomass fuel		biomass, wet	
128	D			>10	suspension burners	boiler	biomass/biobased solids		biomass	
129	D			>10	units	boiler	heavy liquid fuel	liquid	liquid	
130	D			>10	units	boiler	light liquid fuel	liquid	liquid	
131	D			>10	units	boiler	coal/solid fossil fuel	coal/solid	coal/solid	
132	E			>10	fluidized bed	boiler	biomass/biobased solids		biomass	
133	E			>10	fuel cell units	fuel cell	biomass/biobased solids		biomass	
134	E			>10	hybird suspension	boiler	biomass/biobased solids		biomass	
135	E			>10	stokers	boiler	wet biomass fuel		biomass, wet	
136	E			>10	dutch ovens	boiler	biomass/biobased solids		biomass	
137	E			>10	suspension burners	boiler	biomass/biobased solids		biomass	
138	E			>10	stokers	boiler	kiln-dried biomass		biomass, dry	
139	E			>10	boiler	boiler	coal/solid fossil fuel	coal/solid	coal/solid	
140	E			>10	fluidized bed	boiler	coal/solid fossil fuel	coal/solid	coal/solid	

	A	B	D	E	F	G	H	I	J	K
3	MDE		size		1/9/2014	KMW				
4										
5										
6										
7		hp	mW	MMBtu/hr	equipment		fuel	fuel 1	fuel 2	controls/others
8	**Colum**	**Column**	**Column4**	**Column5**	**Column6**	**Column7**	**Column8**	**blank = biomass - wood**	**biomass = biomass + wood**	**Column10**
141	E			>10	stokers	boiler	coal/solid fossil fuel	coal/solid	coal/solid	
142	E			>10	units	boiler	heavy liquid fuel	liquid	liquid	
143	E			>10	units	boiler	light liquid fuel	liquid	liquid	
144	F			>30	boiler	boiler	biomass		biomass	
145	F			10<x<30	boiler	boiler	biomass		biomass	
146	F			>10	boiler	boiler	oil fired	liquid	liquid	
147	F			>30	boiler	boiler	coal	coal/solid	coal/solid	
148	F			10<x<30	boiler	boiler	coal	coal/solid	coal/solid	
149	G			25	boiler	boiler	coal/oil	coal/solid	coal/solid	
150	H		>73	>250	steam generating EGU	boiler	gaseous	gaseous	gaseous	all other fuels
151	H		>73	>250	steam generating EGU	boiler	liquid	liquid	liquid	all other fuels
152	H		>73	>250	steam generating EGU	boiler	liquid	liquid	liquid	coal derived
153	H		>73	>250	steam generating EGU	boiler	liquid	liquid	liquid	shale oil
154	H		>73	>250	steam generating EGU	boiler	solid fuel	coal/solid	coal/solid	coal derived
155	H		>73	>250	steam generating EGU	boiler	solid fuel	coal/solid	coal/solid	subbituminous coal
156	H		>73	>250	steam generating EGU	boiler	gaseous	gaseous	gaseous	coal derived
157	H		>73	>250	steam generating EGU	boiler	solid fuel	coal/solid	coal/solid	bituminous coal
158	H		>73	>250	steam generating EGU	boiler	solid fuel	coal/solid	coal/solid	anthracite coal
159	H		>73	>250	steam generating EGU	boiler	solid fuel	other	other	all other fuels
160	H		>73	>250	steam generating EGU	boiler	solid, liquid or gaseous	solid, liquid or gaseous	solid, liquid or gaseous	
161	H		>73	>250	steam generating EGU	boiler	solid, liquid or gaseous	solid, liquid or gaseous	solid, liquid or gaseous	
162	I		>29	>100	ICI steam generating unit	boiler	nat gas, wood, municiple solid wast	gaseous	gaseous	Nat Gas > 10%
163	I		>29	>100	ICI steam generating unit	boiler	oil	liquid	liquid	
164	I		>29	>100	ICI steam generating unit	boiler	coal	coal/solid	coal/solid	
165	I		>29	>100	ICI steam generating unit	boiler	coal, oil and wood	coal/solid	coal/solid	
166	I		>29	>100	ICI steam generating unit	boiler		other	other	>10% ann.output is elect/m
167	I		>29	>100	ICI steam generating unit	boiler	municiple type solid waste	waste	waste	
168	I		<73	<250	ICI steam generating unit	boiler	wood	wood, wood pellets, wood debris	biomass	>30% wood
169	I		>29	>100	ICI steam generating unit	boiler	wood	wood, wood pellets, wood debris	biomass	
170	I		>73	>250	ICI steam generating unit	boiler	wood	wood, wood pellets, wood debris	biomass	>30% wood
171	J		>8.7	>30	ICI steam generating unit	boiler	coal	coal/solid	coal/solid	other fuel < 10%
172	J		>8.7	>30	ICI steam generating unit	boiler	coal, oil and wood	coal/solid	coal/solid	
173	J		>8.7	>30	ICI steam generating unit	boiler	coal	other	other	other fuel > 10%
174	J		>8.7	>30	ICI steam generating unit	boiler	wood	wood, wood pellets, wood debris	biomass	wood > 30%, no coal
175	J		>8.7	>30	ICI steam generating unit	boiler	wood	wood, wood pellets, wood debris	biomass	>30% wood by heat input
176	J		>8.7	>30	ICI steam generating unit	boiler	wood	wood, wood pellets, wood debris	other	wood < 30%, no coal
177	K		51		waste to energy	CISWI	municipal solid waste combustors	waste	waste	sewage sludge and tires
178	L			18.5	biomass		wood	wood, wood pellets, wood debris	biomass	multicyclone
179	L			4	biomass		clean wood chip, 35 - 40% moisture	wood, wood pellets, wood debris	biomass, wet	multicyclone
180	L			4.8	biomass		wood	wood, wood pellets, wood debris	biomass	multicyclone
181	L			6.5	biomass		clean wood chip, 35 - 40% moisture	wood, wood pellets, wood debris	biomass, wet	multicyclone
182	L			9.5	biomass		clean wood chip, 35 - 40% moisture	wood, wood pellets, wood debris	biomass, wet	multicyclone
183	L			9.7	biomass		clean wood chip, 35 - 40% moisture	wood, wood pellets, wood debris	biomass, wet	multicyclone
184	L			9.7	biomass		wood	wood, wood pellets, wood debris	biomass	multicyclone

	A	B	D	E	F	G	H	I	J	K
3	MDE		size		1/9/2014	KMW				
4										
5										
6										
7		hp	mW	MMBtu/hr	equipment		fuel	fuel 1	fuel 2	controls/others
8	**Colum**	**Colum**	**Column4**	**Column5**	**Column6**	**Column7**	**Column8**	**blank = biomass - wood**	**biomass = biomass + wood**	**Column10**
185	M			MSS	tangential fired-dry bottom	boiler	coal	coal/solid	coal/solid	
186	M			MSS	wall fired-dry bottom	boiler	coal	coal/solid	coal/solid	
187	M			>250	tangential fired-EGU	boiler	coal	coal/solid	coal/solid	
188	M			>250	wall fired-EGU	boiler	coal	coal/solid	coal/solid	
189	M			>250	cell burners-EGU	EGU	coal	coal/solid	coal/solid	
190	M			>250	cyclone-EGU	boiler	coal	coal/solid	coal/solid	May 1 - September 30
191	M			>250	fuel burning equipment	boiler		blank not biomass		May 1 - September 30
192	M			>250	tangential fired high heat-	boiler	coal	coal/solid	coal/solid	
193	M			>250	wall firedhigh heat-EGU	boiler	coal	coal/solid	coal/solid	
194	M			>250	fuel burning equipment	boiler		blank not biomass		Ocotber 1 - April 30
195	M			MSS	tangential fired-wet bottom	boiler	coal	coal/solid	coal/solid	
196	M			MSS	wall fired-wet bottom	boiler	coal	coal/solid	coal/solid	
197	M			>250	cyclone-EGU	boiler	coal	coal/solid	coal/solid	Ocotber 1 - April 30
198	M			>250	fuel burning equipment	boiler	residual oil	liquid	liquid	
199	M			13<x<50	fuel burning equipment	boiler	residual oil	liquid	liquid	
200	M			<250	fuel burning equipment	boiler	solid fuel	coal/solid	coal/solid	
201	M			>250	fuel burning equipment	boiler	solid fuel	coal/solid	coal/solid	
202	M			50<x<250	fuel burning equipment	boiler	residual oil	liquid	liquid	
203	M			13	fuel burning equipment	boiler	solid fuel or residual oil	solid, liquid or gaseous	solid, liquid or gaseous	
204	M			25	fuel burning equipment	boiler	solid fuel or residual oil	solid, liquid or gaseous	solid, liquid or gaseous	
205	M			250	fuel burning equipment	boiler	solid fuel or residual oil	solid, liquid or gaseous	solid, liquid or gaseous	
206	N			>250	large municipal waste co	CISWI		waste	waste	
207	O			<100	boiler	boiler	all: bark, wet wood, dry wood	wood, wood pellets, wood debris	biomass	electrostatic percipitator
208	O			<100	boiler	boiler	all: bark, wet wood, dry wood	wood, wood pellets, wood debris	biomass	wet scrubber
209	O			<100	boiler	boiler	all: bark, wet wood, dry wood	wood, wood pellets, wood debris	biomass	electrolyzed gravel bed
210	O			<100	boiler	boiler	all: bark, wet wood, dry wood	wood, wood pellets, wood debris	biomass	fabric filter
211	O			<100	boiler	boiler	wood wet wood	wood, wood pellets, wood debris	biomass, wet	mechanical collector
212	O			<100	boiler	boiler	wood dry wood	wood, wood pellets, wood debris	biomass, dry	mechanical collector
213	O			<100	boiler	boiler	wood bark and wet wood	wood, wood pellets, wood debris	biomass, wet	mechanical collector
214	O			<100	boiler	boiler	wood bark	wood, wood pellets, wood debris	biomass	mechanical collector
215	O			<100	boiler	boiler	all: bark, wet wood, dry wood	wood, wood pellets, wood debris	biomass	
216	O			<100	boiler	boiler	wood dry wood	wood, wood pellets, wood debris	biomass, dry	
217	O			<0.35	small wood boiler	boiler	clean wood, approved solid fuels	wood, wood pellets, wood debris	biomass	
218	P				energy recovery units	CISWI	solid - biomass		biomass	
219	P				energy recovery units	CISWI	coal	coal/solid	coal/solid	
220	P				incinerator	CISWI		waste	waste	
221	P				Waste Burning Kilns	CISWI		waste	waste	
222	Q				energy recovery units	CISWI	solid - biomass		biomass	
223	Q				energy recovery units	CISWI	coal	coal/solid	coal/solid	
224	Q				incinerator	CISWI		waste	waste	
225	Q				Waste Burning Kilns	CISWI		waste	waste	
226	R			9.5	biomass/wood boiler	boiler	virgin wood chips	wood, wood pellets, wood debris	biomass	heat input 7.9 MMBtu/hr
227	S			4	biomass/wood boiler	boiler	wood chips	wood, wood pellets, wood debris	biomass	heat input 2.3 MMBtu/hr
228	T			2.2	wood fired boiler	boiler	wood chips	wood, wood pellets, wood debris	biomass	test conducted 1995

	A	B	D	E	F	G	H	I	J	K
3	MDE		size		1/9/2014	KMW				
4										
5										
6										
7		hp	mW	MMBtu/hr	equipment		fuel	fuel 1	fuel 2	controls/others
8	**Colum**	**Columr**	**Column4**	**Column5**	**Column6**	**Column7**	**Column8**	**blank = biomass - wood**	**biomass = biomass + wood**	**Column10**
229	T			2.8	wood fired boiler	boiler	wood chips	wood, wood pellets, wood debris	biomass	test conducted 1995
230	T			5.3	wood fired boiler	boiler	wood chips	wood, wood pellets, wood debris	biomass	test conducted 1995
231	V			40	wood fired boiler	boiler	wood chips - green, debarked	wood, wood pellets, wood debris	biomass	multi-cyclone
232	V			40	wood fired boiler	boiler	wood chips - green, debarked	wood, wood pellets, wood debris	biomass	multi-cyclone
233	V			40	wood fired boiler	boiler	wood chips - green, debarked	wood, wood pellets, wood debris	biomass	multi-cyclone
234	V			40	wood fired boiler	boiler	wood chips - green, debarked	wood, wood pellets, wood debris	biomass	multi-cyclone
235	V			40	wood fired boiler	boiler	wood chips - green, debarked	wood, wood pellets, wood debris	biomass	multi-cyclone
236	V			40	wood fired boiler	boiler	wood chips - green, debarked	wood, wood pellets, wood debris	biomass	multi-cyclone
237	W			40	wood fired boiler	boiler	wood chips - green, debarked	wood, wood pellets, wood debris	biomass	flyash dust collectors
238	W			40	wood fired boiler	boiler	wood chips - green, debarked	wood, wood pellets, wood debris	biomass	flyash dust collectors
239	W			40	wood fired boiler	boiler	wood chips - green, debarked	wood, wood pellets, wood debris	biomass	flyash dust collectors
240	W			40	wood fired boiler	boiler	wood chips - green, debarked	wood, wood pellets, wood debris	biomass	flyash dust collectors
241	W			40	wood fired boiler	boiler	wood chips - green, debarked	wood, wood pellets, wood debris	biomass	flyash dust collectors
242	W			40	wood fired boiler	boiler	wood chips - green, debarked	wood, wood pellets, wood debris	biomass	flyash dust collectors
243	X			40	wood fired boiler	boiler	wood chips - green, debarked	wood, wood pellets, wood debris	biomass	flyash dust collectors
244	X			40	wood fired boiler	boiler	wood chips - green, debarked	wood, wood pellets, wood debris	biomass	flyash dust collectors
245	X			40	wood fired boiler	boiler	wood chips - green, debarked	wood, wood pellets, wood debris	biomass	flyash dust collectors
246	X			40	wood fired boiler	boiler	wood chips - green, debarked	wood, wood pellets, wood debris	biomass	flyash dust collectors
247	X			40	wood fired boiler	boiler	wood chips - green, debarked	wood, wood pellets, wood debris	biomass	flyash dust collectors
248	X			40	wood fired boiler	boiler	wood chips - green, debarked	wood, wood pellets, wood debris	biomass	flyash dust collectors
249	Y	102		1.5	wood fired boiler	boiler	wood chips	wood, wood pellets, wood debris	biomass	
250	Y	102		1.5	wood fired boiler	boiler	wood chips	wood, wood pellets, wood debris	biomass	
251	Y	102		1.5	wood fired boiler	boiler	wood chips	wood, wood pellets, wood debris	biomass	
252	Y	102		1.5	wood fired boiler	boiler	wood chips	wood, wood pellets, wood debris	biomass	
253	Y	102		1.5	wood fired boiler	boiler	wood chips	wood, wood pellets, wood debris	biomass	
254	Y	102		1.5	wood fired boiler	boiler	wood chips	wood, wood pellets, wood debris	biomass	
255	Z				spreader-stoker	boiler	wood	wood, wood pellets, wood debris	biomass	controlled
256	Z				spreader-stoker	boiler	wood	wood, wood pellets, wood debris	biomass	uncontrolled
257	Z				slash and burn	other	wood	wood, wood pellets, wood debris	biomass	uncontrolled
258	Z				slash and burn	other	wood	wood, wood pellets, wood debris	biomass	controlled
259										
284										
285		interpretted value, based on information contained in the document. Intended to aid in sort/search								
286										
287										
288										

	L	M	N	O	P	Q	R	S	T	U	V	W	X
3				particulate matter									
4				heat input									
5				lb/MMBtu	gr/scfd	gr/dscf	mg/dscm	mg/dscm	ng/j	mg/MJ	lb/hr	lb/MMBtu	lb/MMBtu
6				filterable	--	--	--	filterable	--			--	
7	regulation or te	state	age										
8	**Column11**	**Column12**	**Column13**	**Column14**	**Column15**	**Column16**	**Column17**	**Column18**	**Column19**	**Column46**		**Column20**	**Column21**
9													
10	regulation	EPA	new	0.0032									
11	regulation	EPA	new	0.0011									
12	regulation	EPA	new	0.013									
13	regulation	EPA	new	0.0011									
14	regulation	EPA	new	0.0098									
15	regulation	EPA	new	0.02									
16	regulation	EPA	new	0.026									
17	regulation	EPA	new	0.03									
18	regulation	EPA	new	0.03									
19	regulation	EPA	new	0.03									
20	regulation	MD	after 1/17/1972		0.03		68.7						
21	regulation	MD			0.05		115						
22	regulation	MD			0.03		69						
23	regulation	MD			0.015		34						
24	regulation	MD			0.086		197						
25	regulation	MD	before 6/20/1996		0.029		66						
26	regulation	MD	before 6/20/1996		0.02		46						
27	regulation	MD	before 6/20/1996		0.011		25						
28	regulation	MD	before 12/1/2008		0.029		66						
29	regulation	MD	before 12/1/2008		0.015		34						
30	regulation	MD	before 12/1/2008		0.011		25						
31	regulation	MD	before 6/20/1996		0.086		197						
32	regulation	MD	before 12/1/2008		0.038		87						
33	regulation	MD	before 1/17/1972		0.3		687						
34	regulation	MD	after 1/17/1972		0.2		458						
35	regulation	MD	after 1/17/1972		0.1		229						
36	regulation	MD			0.03		68.7						
37	regulation	MD	before 4/28/2009		0.012		27						
38	regulation	MD	after 4/28/2009				25						
39	regulation	MD			0.03		68.7						
40	regulation	MD	before 6/11/73		0.05		92						
41	regulation	MD	non-ozone season										
42	regulation	MD	before 5/1/2003										
43	regulation	MD	before 5/1/2003										
44	regulation	MD	before 5/1/2003										
45	regulation	MD	before 5/1/2003										
46	regulation	MD											
47	regulation	EPA	existing	0.062									
48	regulation	EPA	existing	0.04									
49	regulation	EPA	existing	0.0079									
50	regulation	EPA	existing	0.02									
51	regulation	EPA	existing	0.037									
52	regulation	EPA	existing	0.051									

	L	M	N	O	P	Q	R	S	T	U	V	W	X
3				particulate matter									
4				heat input									
5				lb/MMBtu	gr/scfd	gr/dscf	mg/dscm	mg/dscm	ng/j	mg/MJ	lb/hr	lb/MMBtu	lb/MMBtu
6				filterable	--	--	--	filterable	--			--	
7	regulation or te	state	age										
8	**Column11**	**Column12**	**Column13**	**Column14**	**Column15**	**Column16**	**Column17**	**Column18**	**Column19**	**Column46**		**Column20**	**Column21**
53	regulation	EPA	existing	0.11									
54	regulation	EPA	existing	0.28									
55	regulation	EPA	existing	0.32									
56	regulation	EPA	existing	0.44									
57	test results	MD	before 1/1/2011										
58	test results	MD	before 7/1/2010										
59	test results	CA											0.430
60	test results	CA											0.780
61	test results	new eng.		0.02									
62	test results	NY		0.00005						0.021			
63	test results	NY		0.06						25			
64	test results	NY		0.11						41			
65	test results	NY		0.05						21			
66	test results	VT		0.008						3.4			
67	test results	NY		0.06						25			
68	test results	VT		0.26						112			
69	test results	VT		0.28						120			
70	regulation	CT		0.1									
71	test results	new eng.		0.1									
72	test results	new eng.		0.2									
73	regulation	NY		0.6									
74	regulation	MD											
75	regulation	MD											
76	regulation	MD											
77	regulation	MD											
78	regulation	MD											
79	regulation	MD											
80	regulation	MD											
81	regulation	MD											
82	regulation	MD											
83	regulation	MD											
84	regulation	MD											
85	regulation	MD											
86	regulation	MD	May 1 - Sept 30										
87	regulation	MD											
88	regulation	MD	May 1 - Sept 30										
89	regulation	MD											
90	regulation	MD	Oct 1 - Apr 30										
91	regulation	MD	Oct 1 - Apr 30										
92	regulation	MD											
93	regulation	MD											
94	regulation	MD											
95	regulation	MD											
96	regulation	MD											

	L	M	N	O	P	Q	R	S	T	U	V	W	X
3				particulate matter									
4				heat input									
5				lb/MMBtu	gr/scfd	gr/dscf	mg/dscm	mg/dscm	ng/j	mg/MJ	lb/hr	lb/MMBtu	lb/MMBtu
6				filterable	--	--	--	filterable	--			--	
7	regulation or te	state	age										
8	**Column11**	**Column12**	**Column13**	**Column14**	**Column15**	**Column16**	**Column17**	**Column18**	**Column19**	**Column46**		**Column20**	**Column21**
97	regulation	MD											
98	regulation	MD											
99	regulation	MD											
100	regulation	MD											
101	regulation	MD	existing, new		na		na						
102	regulation	MD	before 7/1/1995		0.05		114						
103	regulation	MD	new		0.03		69						
104	regulation	MD	before 3/31/2010		0.03		69						
105	regulation	MD	before 7/1/1995		0.02		46						
106	regulation	MD	new		0.01		23						
107	regulation	MD	existing, new		0.03		69						
108	regulation	MD	existing, new		0.02		46						
109												0.32	
110			after April 1, 2010									0.6	
111	regulation	DE	permit condition 2013								0.36		
112	regulation	EPA	alternative June2010	0.008									
113	regulation	EPA	alternative June2010	0.0098									
114	regulation	EPA	alternative June2010	0.02									
115	regulation	EPA	alternative June2010	0.026									
116	regulation	EPA	alternative June2010	0.03									
117	regulation	EPA	alternative June2010	0.03									
118	regulation	EPA	alternative June2010	0.03									
119	regulation	EPA	alternative June2010	0.013									
120	regulation	EPA	alternative June2010	0.002									
121	regulation	EPA	alternative June2010	0.0011									
122	regulation	EPA	alternative May2011	0.0032									
123	regulation	EPA	alternative May2011	0.0098									
124	regulation	EPA	alternative May2011	0.02									
125	regulation	EPA	alternative May2011	0.026									
126	regulation	EPA	alternative May2011	0.03									
127	regulation	EPA	alternative May2011	0.03									
128	regulation	EPA	alternative May2011	0.03									
129	regulation	EPA	alternative May2011	0.013									
130	regulation	EPA	alternative May2011	0.013									
131	regulation	EPA	alternative May2011	0.0011									
132	regulation	EPA	alternative Dec2011	0.0098									
133	regulation	EPA	alternative Dec2011	0.02									
134	regulation	EPA	alternative Dec2011	0.026									
135	regulation	EPA	alternative Dec2011	0.03									
136	regulation	EPA	alternative Dec2011	0.036									
137	regulation	EPA	alternative Dec2011	0.051									
138	regulation	EPA	alternative Dec2011	0.32									
139	regulation	EPA	alternative Dec2011	0.0011									
140	regulation	EPA	alternative Dec2011	0.0011									

	L	M	N	O	P	Q	R	S	T	U	V	W	X
3				particulate matter									
4				heat input									
5				lb/MMBtu	gr/scfd	gr/dscf	mg/dscm	mg/dscm	ng/j	mg/MJ	lb/hr	lb/MMBtu	lb/MMBtu
6				filterable	--	--	--	filterable	--			--	
7	regulation or te	state	age										
8	**Column11**	**Column12**	**Column13**	**Column14**	**Column15**	**Column16**	**Column17**	**Column18**	**Column19**	**Column46**		**Column20**	**Column21**
141	regulation	EPA	alternative Dec2011	0.028									
142	regulation	EPA	alternative Dec2011	0.0013									
143	regulation	EPA	alternative Dec2011	0.0011									
144	regulation	EPA	new	0.03									
145	regulation	EPA	new	0.07									
146	regulation	EPA	new	0.03									
147	regulation	EPA	new	0.03									
148	regulation	EPA	new	0.42									
149	regulation	MD	1979		0.1								
150	regulation	EPA	after 9/18/1978										
151	regulation	EPA	after 9/18/1978										
152	regulation	EPA	after 9/18/1978										
153	regulation	EPA	after 9/18/1978										
154	regulation	EPA	after 9/18/1978										
155	regulation	EPA	after 9/18/1978										
156	regulation	EPA	after 9/18/1978										
157	regulation	EPA	after 9/18/1978										
158	regulation	EPA	after 9/18/1978										
159	regulation	EPA	after 9/18/1978										
160	regulation	EPA	before 2/28/2005						13			0.03	
161	regulation	EPA	after 2/28/2005						6.4			0.015	
162	regulation	EPA											
163	regulation	EPA	before 2/28/2005						43			0.1	
164	regulation	EPA	before 2/28/2005						22			0.051	
165	regulation	EPA	after 2/28/2005						13			0.03	
166	regulation	EPA	after 2/27/2006										
167	regulation	EPA	before 2/28/2005						43			0.1	
168	regulation	EPA	after 2/28/2005						43			0.1	
169	regulation	EPA	before 2/28/2005						43			0.1	
170	regulation	EPA	after 2/28/2005						37			0.085	
171	regulation	EPA	before 2/28/2005						22			0.051	
172	regulation	EPA	after 2/28/2005						13			0.03	
173	regulation	EPA	before 2/28/2005						43			0.1	
174	regulation	EPA	before 2/28/2005						43			0.1	
175	regulation	EPA	after 2/28/2005						43			0.1	
176	regulation	EPA	before 2/28/2005						130			0.3	
177	test results	MD	2011										
178	test results	PA	9/1/2008	0.150									0.151
179	test results	PA	3/24/2012	0.102									
180	test results	MA	3/4/2009										0.039
181	test results	PA											
182	test results	PA	4/14/2012	0.092									0.062
183	test results	PA		0.010									
184	test results	MA	3/25/2009										0.062

	L	M	N	O	P	Q	R	S	T	U	V	W	X
3				particulate matter									
4				heat input									
5				lb/MMBtu	gr/scfd	gr/dscf	mg/dscm	mg/dscm	ng/j	mg/MJ	lb/hr	lb/MMBtu	lb/MMBtu
6				filterable	--	--	--	filterable	--			--	
7	regulation or te	state	age										
8	**Column11**	**Column12**	**Column13**	**Column14**	**Column15**	**Column16**	**Column17**	**Column18**	**Column19**	**Column46**		**Column20**	**Column21**
185	regulation	MD	new										
186	regulation	MD	new										
187	regulation	MD	new										
188	regulation	MD	new										
189	regulation	MD	new										
190	regulation	MD	new										
191	regulation	MD	new										
192	regulation	MD	new										
193	regulation	MD	new										
194	regulation	MD	new										
195	regulation	MD	new										
196	regulation	MD	new										
197	regulation	MD	new										
198	regulation	MD	new		0.01								
199	regulation	MD	new		0.03								
200	regulation	MD	new		0.03								
201	regulation	MD	new		0.03								
202	regulation	MD	new		0.02								
203	regulation	MD	after 1/17/1972									0.4	
204	regulation	MD	after 1/17/1972									0.4	
205	regulation	MD	after 1/17/1972									0.1	
206	regulation	MD	new				25						
207	test results	AP-42	new	0.054									0.040
208	test results	AP-42	new	0.066									0.065
209	test results	AP-42	new	0.100									0.074
210	test results	AP-42	new	0.100									0.074
211	test results	AP-42	new	0.220									0.200
212	test results	AP-42	new	0.300									0.270
213	test results	AP-42	new	0.350									0.320
214	test results	AP-42	new	0.540									0.490
215	test results	AP-42	new										
216	test results	AP-42	new										
217	test results	AP-42	new									0.32	
218	regulation	EPA	after 6/4/2010					5.1					
219	regulation	EPA	after 6/4/2010					160					
220	regulation	EPA	after 6/4/2010					18					
221	regulation	EPA	after 6/4/2010					2.2					
222	regulation	EPA	after 5/20/2011					11					
223	regulation	EPA	after 5/20/2011					160					
224	regulation	EPA	after 5/20/2011					34					
225	regulation	EPA	after 5/20/2011					4.6					
226	test results	PA	4/14/2012			0.049						0.092	0.062
227	test results	PA	3/24/2012			0.049						0.102	
228	test results	VT				0.051						0.120	

	L	M	N	O	P	Q	R	S	T	U	V	W	X
3				particulate matter									
4				heat input									
5				lb/MMBtu	gr/scfd	gr/dscf	mg/dscm	mg/dscm	ng/j	mg/MJ	lb/hr	lb/MMBtu	lb/MMBtu
6				filterable	--	--	--	filterable	--			--	
7	regulation or te	state	age										
8	**Column11**	**Column12**	**Column13**	**Column14**	**Column15**	**Column16**	**Column17**	**Column18**	**Column19**	**Column46**		**Column20**	**Column21**
229	test results	VT				0.043						0.098	
230	test results	VT				0.080						0.180	
231	test results	MD	11/27/2007			0.094							
232	test results	MD	11/27/2007			0.085							
233	test results	MD	11/28/2007			0.114							
234	test results	MD	11/27/2007			0.129							
235	test results	MD	11/27/2007			0.128							
236	test results	MD	11/28/2007			0.125							
237	test results	MD	12/30/2002									0.164	
238	test results	MD	12/30/2002									0.265	
239	test results	MD	12/30/2002									0.187	
240	test results	MD	12/31/2002									0.290	
241	test results	MD	12/31/2002									0.278	
242	test results	MD	12/31/2002									0.262	
243	test results	MD	5/16/1989			0.097						0.206	
244	test results	MD	5/16/1989			0.126						0.263	
245	test results	MD	5/17/1989			0.127						0.262	
246	test results	MD	5/16/1989			0.126						0.274	
247	test results	MD	5/16/1989			0.093						0.202	
248	test results	MD	5/17/1989			0.183						0.406	
249	test results	RI	3/4/2009										
250	test results	RI	3/4/2009										
251	test results	RI	3/4/2009										
252	test results	RI	3/5/2009										0.016
253	test results	RI	3/5/2009										0.016
254	test results	RI	3/5/2009										0.016
255	test results	WA											0.020
256	test results	WA											0.570
257	test results	WA											1.300
258	test results	WA											1.300
259													
284													
285													
286													
287													
288													

	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL
3	PM10				PM2.5					particulate matter				Nox
4										gross energy output				heat i
5	mg/dscm	mg/dscm	mg/dscm	gr/dscf	lb/MMBtu	mg/dscm	mg/dscm	mg/dscm	gr/dscf	lb/MWh	ng/j	lb/MMBtu	gr/dscf	ppmv
6		@12%CO2	@7%O2	--			@12%CO2	@7%O2	--					
7														
8	**Column22**	**Column23**	**Column24**	**Column25**	**Column26**	**Column27**	**Column28**	**Column29**	**Column30**	**Column31**	**Column32**	**Column33**	**Column34**	**Column35**
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														
29														
30														
31														
32														
33														
34														
35														
36														
37														
38														
39														
40														
41												0.99		
42														
43														
44														
45														
46														
47														
48														
49														
50														
51														
52														

	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL
3	PM10				PM2.5					particulate matter		Nox		
4										gross energy output		heat ir		
5	mg/dscm	mg/dscm	mg/dscm	gr/dscf	lb/MMBtu	mg/dscm	mg/dscm	mg/dscm	gr/dscf	lb/MWh	ng/j	lb/MMBtu	gr/dscf	ppmv
6		@12%CO2	@7%O2	--			@12%CO2	@7%O2	--					
7														
8	**Column22**	**Column23**	**Column24**	**Column25**	**Column26**	**Column27**	**Column28**	**Column29**	**Column30**	**Column31**	**Column32**	**Column33**	**Column34**	**Column35**
53														
54														
55														
56														
57														
58														
59												0.410		
60												0.330		
61														
62														
63														
64														
65														
66														
67														
68														
69														
70														
71														
72														
73														
74												0.2		
75												0.2		
76												0.25		
77												0.25		
78												0.38		
79												0.38		
80												1		
81												1		
82												0.3		
83												0.45		
84												0.5		
85												0.6		
86												0.7		
87												0.7		
88												0.7		
89												0.8		
90												0.99		
91												1.5		
92												0.2		
93												0.2		
94												0.25		
95												0.25		
96												0.38		

	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL
3	PM10				PM2.5					particulate matter		Nox		
4										gross energy output		heat ir		
5	mg/dscm	mg/dscm	mg/dscm	gr/dscf	lb/MMBtu	mg/dscm	mg/dscm	mg/dscm	gr/dscf	lb/MWh	ng/j	lb/MMBtu	gr/dscf	ppmv
6		@12%CO2	@7%O2	--			@12%CO2	@7%O2	--					
7														
8	**Column22**	**Column23**	**Column24**	**Column25**	**Column26**	**Column27**	**Column28**	**Column29**	**Column30**	**Column31**	**Column32**	**Column33**	**Column34**	**Column35**
97												0.38		
98												0.65		
99												1		
100												1		
101														
102														
103														
104														
105														
106														
107														
108														
109														
110														
111														
112														
113														
114														
115														
116														
117														
118														
119														
120														
121														
122														
123														
124														
125														
126														
127														
128														
129														
130														
131														
132														
133														
134														
135														
136														
137														
138														
139														
140														

	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL
3	PM10				PM2.5					particulate matter		Nox		
4										gross energy output		heat ir		
5	mg/dscm	mg/dscm	mg/dscm	gr/dscf	lb/MMBtu	mg/dscm	mg/dscm	mg/dscm	gr/dscf	lb/MWh	ng/j	lb/MMBtu	gr/dscf	ppmv
6		@12%CO2	@7%O2	--			@12%CO2	@7%O2	--					
7														
8	**Column22**	**Column23**	**Column24**	**Column25**	**Column26**	**Column27**	**Column28**	**Column29**	**Column30**	**Column31**	**Column32**	**Column33**	**Column34**	**Column35**
141														
142														
143														
144														
145														
146														
147														
148														
149														
150												0.2		
151												0.3		
152												0.5		
153												0.5		
154												0.5		
155												0.5		
156												0.5		
157												0.6		
158												0.6		
159												0.6		
160														
161										0.14	18			
162												0.3		
163														
164														
165														
166														
167														
168														
169														
170														
171														
172														
173														
174														
175														
176														
177														
178												0.180		
179												0.161		
180					0.038							0.162		
181														
182												0.255		
183												0.160		
184					0.06							0.185		

	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL
3	PM10				PM2.5					particulate matter				Nox
4										gross energy output				heat in
5	mg/dscm	mg/dscm	mg/dscm	gr/dscf	lb/MMBtu	mg/dscm	mg/dscm	mg/dscm	gr/dscf	lb/MWh	ng/j	lb/MMBtu	gr/dscf	ppmv
6		@12%CO2	@7%O2	--			@12%CO2	@7%O2	--					
7														
8	**Column22**	**Column23**	**Column24**	**Column25**	**Column26**	**Column27**	**Column28**	**Column29**	**Column30**	**Column31**	**Column32**	**Column33**	**Column34**	**Column35**
185												0.38		
186												0.38		
187												0.45		
188												0.5		
189												0.6		
190												0.7		
191												0.7		
192												0.7		
193												0.8		
194												0.99		
195												1		
196												1		
197												1.5		
198														
199														
200														
201														
202														
203														
204														
205														
206														205
207					0.035									
208					0.065									
209					0.063									
210					0.065									
211					0.120									
212					0.160									
213					0.190									
214					0.290									
215												0.220		
216												0.490		
217														
218														290
219														340
220														23
221														200
222														290
223														340
224														53
225														630
226				0.032								0.255		
227												0.161		
228														

	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL
3	PM10				PM2.5					particulate matter		Nox		
4										gross energy output		heat ir		
5	mg/dscm	mg/dscm	mg/dscm	gr/dscf	lb/MMBtu	mg/dscm	mg/dscm	mg/dscm	gr/dscf	lb/MWh	ng/j	lb/MMBtu	gr/dscf	ppmv
6		@12%CO2	@7%O2	--			@12%CO2	@7%O2	--					
7														
8	**Column22**	**Column23**	**Column24**	**Column25**	**Column26**	**Column27**	**Column28**	**Column29**	**Column30**	**Column31**	**Column32**	**Column33**	**Column34**	**Column35**
229														
230														
231														
232														
233														
234														
235														
236														
237														
238														
239														
240														
241														
242														
243														
244														
245														
246														
247														
248														
249												0.157	0.0052	
250												0.158	0.0052	
251												0.169	0.0056	
252	18.9	16.7	18.9	0.0083	0.0134	16	14.1	16	0.0070					
253	18.5	16.5	18.7	0.0081	0.0134	15.9	14.1	16	0.0070					
254	18.4	16.9	19	0.0081	0.0143	16.6	15.2	17	0.0072					
255												0.100		
256												0.220		
257												0.300		
258												0.300		
259														
284														
285														
286														
287														
288														

	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AW
3	x			Nox				Nox		
4	put			gross energy output						
5	ppm	lb/hr	ng/j	lb/MWh	grams/brake horsepower	g/HP-hr	ng/j	ppmvd, @ 7% O2	ppm @ 15% O2	
6										
7										reference
8	**Column36**		**Column37**	**Column38**	**Column39**	**Column40**	**Column4**	**Column42**	**Column43**	**Column45**
9										
10										A
11										A
12										A
13										A
14										A
15										A
16										A
17										A
18										A
19										A
20										Af
21								250		Ag
22								250		Ag
23								250		Ag
24								250		Ag
25								190		Ag
26								190		Ag
27								140		Ag
28								190		Ag
29								190		Ag
30								140		Ag
31								250		Ag
32								130		Ag
33										Ag
34										Ag
35										Ag
36										Ag
37										Ag
38								205		Ag
39										Ah
40										Ai
41										Aj
42									110	Al
43									125	Al
44									175	Al
45									125	Al
46					1.4					Am
47										B
48										B
49										B
50										B
51										B
52										B

	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AW
3	(			Nox				Nox		
4	put			gross energy output						
5	ppm	lb/hr	ng/j	lb/MWh	grams/brake horsepower	g/HP-hr	ng/j	ppmvd, @ 7% O2	ppm @ 15% O2	
6										
7										reference
8	**Column36**		**Column37**	**Column38**	**Column39**	**Column40**	**Column4**	**Column42**	**Column43**	**Column45**
53										B
54										B
55										B
56										B
57						2				Bh
58						2				Bh
59										Bk
60										Bk
61										Bm
62										Bm
63										Bm
64										Bm
65										Bm
66										Bm
67										Bm
68										Bm
69										Bm
70										Bm
71										Bm
72										Bm
73										Bm
74										Bn
75										Bn
76										Bn
77										Bn
78										Bn
79										Bn
80										Bn
81										Bn
82										Bo
83										Bo
84										Bo
85										Bo
86										Bo
87										Bo
88										Bo
89										Bo
90										Bo
91										Bo
92										Bp
93										Bp
94										Bp
95										Bp
96										Bp

	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AW
3	x			Nox				Nox		
4	put			gross energy output						
5	ppm	lb/hr	ng/j	lb/MWh	grams/brake horsepower	g/HP-hr	ng/j	ppmvd, @ 7% O2	ppm @ 15% O2	
6										
7										reference
8	**Column36**		**Column37**	**Column38**	**Column39**	**Column40**	**Column4**	**Column42**	**Column43**	**Column45**
97										Bp
98										Bp
99										Bp
100										Bp
101										Bq
102										Bq
103										Bq
104										Bq
105										Bq
106										Bq
107										Bq
108										Bq
109										Br
110										Br
111		0.078								Bt
112										C
113										C
114										C
115										C
116										C
117										C
118										C
119										C
120										C
121										C
122										D
123										D
124										D
125										D
126										D
127										D
128										D
129										D
130										D
131										D
132										E
133										E
134										E
135										E
136										E
137										E
138										E
139										E
140										E

	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AW
3	x			Nox				Nox		
4	put			gross energy output						
5	ppm	lb/hr	ng/j	lb/MWh	grams/brake horsepower	g/HP-hr	ng/j	ppmvd, @ 7% O2	ppm @ 15% O2	
6										
7										reference
8	**Column36**		**Column37**	**Column38**	**Column39**	**Column40**	**Column4**	**Column42**	**Column43**	**Column45**
141										E
142										E
143										E
144										F
145										F
146										F
147										F
148										F
149										G
150			86							H
151			130							H
152			210							H
153			210							H
154			210							H
155			210							H
156			210							H
157			260							H
158			260							H
159			260							H
160										H
161										H
162			130							I
163										I
164										I
165										I
166				2.1			270			I
167										I
168										I
169										I
170										I
171										J
172										J
173										J
174										J
175										J
176										J
177								45		K
178										L
179										L
180										L
181										L
182										L
183										L
184										L

	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AW
3	x			Nox				Nox		
4	put			gross energy output						
5	ppm	lb/hr	ng/j	lb/MWh	grams/brake horsepower	g/HP-hr	ng/j	ppmvd, @ 7% O2	ppm @ 15% O2	
6										
7										reference
8	**Column36**		**Column37**	**Column38**	**Column39**	**Column40**	**Column4**	**Column42**	**Column43**	**Column45**
185										M
186										M
187										M
188										M
189										M
190										M
191										M
192										M
193										M
194										M
195										M
196										M
197										M
198										M
199										M
200										M
201										M
202										M
203										M
204										M
205										M
206										N
207										O
208										O
209										O
210										O
211										O
212										O
213										O
214										O
215										O
216										O
217										O
218										P
219										P
220										P
221										P
222										Q
223										Q
224										Q
225										Q
226	159.1									R
227	92.3									S
228										T

	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AW
3	x			Nox				Nox		
4	put			gross energy output						
5	ppm	lb/hr	ng/j	lb/MWh	grams/brake horsepower	g/HP-hr	ng/j	ppmvd, @ 7% O2	ppm @ 15% O2	
6										
7										reference
8	**Column36**		**Column37**	**Column38**	**Column39**	**Column40**	**Column4**	**Column42**	**Column43**	**Column45**
229										T
230										T
231								102.67		V
232								102.99		V
233								95.12		V
234								113.01		V
235								117.6		V
236								92.33		V
237										W
238										W
239										W
240										W
241										W
242										W
243										X
244										X
245										X
246										X
247										X
248										X
249									41.6	Y
250									42	Y
251									44.8	Y
252										Y
253										Y
254										Y
255										Z
256										Z
257										Z
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259										
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