

*RESEARCH
REPORT*

Pollution from Pennsylvania's Biomass Energy Sector: Resources for Citizen Involvement

Report to Accompany Online Database and Map
of Pennsylvania Biomass Energy Facilities

Mary S. Booth, PhD
Partnership for Policy Integrity
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Executive Summary

Historically, the biomass energy industry in Pennsylvania has been highly polluting. Facilities burn a variety of fuels, from paper-making wastes to railroad ties, and are lightly regulated, allowing them to emit large amounts of pollution relative to their size. In recent years, the biomass industry has tried to create a new image for biomass as providing “clean” and “green” energy that is worthy of development alongside wind and solar energy, in order to cash in on renewable energy subsidies. The campaign to sell bioenergy as “clean” has been successful in some places – notably in Pennsylvania, where in recent years the State and Federal government allocated nearly \$70 million in grants and loans for wood pellet manufacturing and biomass boiler installations at businesses, schools, and other institutions. However, what didn’t occur in Pennsylvania as those funds were allocated was any effort to actually make biomass energy worthy of the moniker of “clean” energy. Instead, a review of permitting for the current fleet of biomass energy facilities in Pennsylvania finds that even the newest facilities are allowed to emit as much air pollution as biomass boilers at sawmills and industrial industries that first received their air permits decades ago.

Improving air quality in Pennsylvania requires that polluting facilities reduce their emissions, and making that happen often requires local involvement in the air permitting process. We described the air pollution impacts of the Pennsylvania biomass energy sector in our 2012 report, “Biomass Energy in Pennsylvania: Implications for Air Quality, Carbon Emissions, and Forests.”¹ To make information on commercial and industrial biomass burning available to the public and policymakers, and to facilitate public involvement in air permitting, we have now created an online database and map of bioenergy and pellet manufacturing facilities in Pennsylvania (at <http://www.pfpi.net/bioenergy-in-pennsylvania>), accompanied by this report. The database takes information from the Pennsylvania Bulletin on boiler capacity, pollution emissions, emission controls, permit number, and permit renewal date for facilities burning biomass or manufacturing pellets in Pennsylvania, and makes it available in a single location.

Facility operating permits regulate how much air pollution a facility is allowed to emit. Operating permits are renewed by the Pennsylvania Department of Environmental Protection (DEP) every five years, and this renewal (or the granting of a new permit) is virtually the public's only opportunity to weigh in with the DEP on how a facility can reduce its emissions. In compiling the database of biomass-burning facilities listed in the Pennsylvania Bulletin, we determined that inconsistency and lack of information in the Bulletin presents a significant obstacle to public involvement. Further, DEP does not make permits and other documents available electronically, but requires that people visit sometimes remote offices to review paper copies of permits if they want to obtain information.

Our database and report provide an overview of the current Pennsylvania bioenergy sector. Main findings include:

- Air quality is compromised in many regions of Pennsylvania. According to EPA, many counties still don’t achieve federal health standards for particulate matter, ozone, and even lead. Data reported by schools to the Pennsylvania Department of Health indicate that Pennsylvania’s asthma rate for students was 12.18% statewide in 2012/2013, with 80% of counties showing rates over 8%.
- Permits for 102 bioenergy and pellet manufacturing facilities have been recently referenced in the Pennsylvania Bulletin. Most of these are for sawmills and other commercial or

¹ http://www.pfpi.net/wp-content/uploads/2012/12/PFPI-PA-Biomass-Energy-Report_12_18_12.pdf

industrial facilities that are relatively small in size, where biomass boiler capacity ranges from less than 10 MMBtu/hr to 50 MMBtu/hr.

- Almost without exception, older biomass burners have the potential to be highly polluting, as nearly all are required to use only minimal emissions controls for particulate matter (PM). Typical permitted emission rates allow a 20 MMBtu/hr biomass boiler to emit 20 tons of PM per year, a 30 MMBtu/hr boiler to emit 30 tons, and so on. These facilities also emit ozone precursors, carbon monoxide, and hazardous air pollutants.
- Almost none of the new biomass boilers installed at schools, businesses, or industrial sites in recent years, even those receiving grants and subsidies, have been required to use anything more than a multi-clone for PM control, the same outdated technology that is employed at older biomass burners. The exceptions that are apparent in the Pennsylvania Bulletin have been the State Correctional Institute at Cresson, and Evangelical Community Hospital in Union County, which both utilize more sophisticated emissions controls to reduce PM emissions.
- Since the mid-2000's, Pennsylvania and the Federal government have allocated over \$69 million in grants and loans for biomass energy and wood pellet manufacturing facilities. We checked the status of companies receiving these grants and loans, but in several cases were unable to find evidence companies exist any longer, or that subsidized facilities have been built. In all, 19 out of the total 38 facilities that received support either no longer exist or have not yet received an operating permit.

Especially in areas that already suffer from the burden of air pollution, economic modeling shows that each additional ton of pollution emitted from poorly regulated facilities imposes hundreds of thousands of dollars in costs from illness, lost productivity, and shortened lifespans. Rather than promoting and subsidizing biomass as “clean” energy in Pennsylvania, the state should require biomass burners to install effective emissions controls that reduce emissions of harmful pollutants.

The bioenergy map and database are available at <http://www.pfpi.net/bioenergy-in-pennsylvania>

Introduction: A Database of Bioenergy Facilities in Pennsylvania

Industrial and commercial boilers fueled by biomass are a significant source of air pollution in the United States. One reason is that industrial boilers are allowed to emit pollution at higher rates than larger facilities such as power plants, so even though they are relatively small, their total impact can be large. Biomass boilers are additionally allowed to emit as much or more particulate matter (PM) and other pollutants as same-sized oil- or coal-fired boilers,² and increasing use of contaminated wood as fuel means biomass boilers can emit heavy metals and other air toxics. The proximity of industrial boilers to population centers also increases the threat they present to local air quality.

To provide an overview of the Pennsylvania bioenergy sector, in 2012 we published “Biomass Energy in Pennsylvania: Implications for Air Quality, Carbon Emissions, and Forests.”³ That report discussed

² United States Environmental Protection Agency. 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. February 1, 2013.

³ “Biomass Energy in Pennsylvania: Implications for Air Quality, Carbon Emissions, and Forests.” At http://www.pfpi.net/wp-content/uploads/2012/12/PFPI-PA-Biomass-Energy-Report_12_18_12.pdf

how the state has allocated tens of millions of dollars to support new biomass-burning facilities as “clean” energy, mostly as grants and loans for wood-pellet manufacturing plants and small-scale biomass boilers. We found that most of the older industrial biomass boilers do not use effective emissions controls, so that a single facility can emit tens to hundreds of tons of pollution per year. Yet while technology exists that could reduce emissions by 90%, Pennsylvania still has not required that new biomass burners install anything more than minimal emissions controls, even while allocating hundreds of thousands of dollars in grants and loans to individual facilities.

With each passing year, bioenergy pollution impacts increase, as commercial and residential wood burning is promoted and subsidized as a locally-sourced replacement for fossil fuels. Our 2012 report found that the magnitude of emissions from commercial and industrial biomass burners was similar to, and sometimes exceeded, residential wood-burning emissions at the county level in Pennsylvania. A single biomass boiler, such as that installed at a school, can emit many times the pollution of a residential woodstove (Table 1).

Combustion unit and control	Particulate matter emission rate	PM emitted over 6 months of operation (pounds)
Old woodstove emitting at startup rate full-time ⁴	60 gr/hr	579
New EPA-certified woodstove emitting at optimal rate full-time ⁵	3 gr/hr	29
4.4 MMBtu/hr school boiler emitting at permitted rate full-time ⁶	0.22 lb/MMBtu	4,240
4.4 MMBtu/hr school boiler operating at optimal rate full-time ⁷	0.1 lb/MMBtu	1,927
4.4 MMBtu/hr school boiler with electrostatic precipitator	0.03 lb/MMBtu	578

Table 1. Comparison of particulate matter emissions from a residential woodstove and a small institutional biomass burner. Even assuming unrealistically high emissions from the woodstove, emissions from the institutional burner are far greater.

⁴ The startup rate of 60 grams/hr is drawn from an actual emissions profile for a woodstove tested in a 1979 study (Samuel S. Butcher & Edmund M. Sorenson (1979) A Study of Wood Stove Particulate Emissions, Journal of the Air Pollution Control Association, 29:7, 724-728, DOI: 10.1080/00022470.1979.10470854 (available at <http://www.tandfonline.com/doi/pdf/10.1080/00022470.1979.10470854>). Initial emissions rates were about 1 gram per minute for 10 minutes after startup; after one hour, emissions were less than 0.1 gram per minute. We applied the initial startup rate of 1 gr/min to full-time operation to provide a worst-case scenario.

⁵ A list of EPA-certified woodstoves and their emissions rates in grams per hour is available at <http://www.epa.gov/compliance/resources/publications/monitoring/caa/woodstoves/certifiedwood.pdf>. For a discussion of how loopholes in EPA’s “boiler” and “waste” rules could increase toxic pollutant emissions from biomass burners, see our report “Trees, Trash, and Toxics: How Biomass Energy Has Become the New Coal,” at <http://www.pfpi.net/wp-content/uploads/2014/04/PFPI-Biomass-is-the-New-Coal-April-2-2014.pdf>.

⁶ 4.4 MMBtu/hr is the capacity of the wood-fired boiler installed at the East Lycoming School District. Some boilers installed at schools in Pennsylvania have been up to three times this size. Most of the school boilers are permitted at a PM emissions rate of around 0.22 lb/MMBtu.

⁷ We estimated an “optimal” emissions rate based on the actual emissions from the wood boiler installed at Matson Lumber in Jefferson County, which underwent emissions testing indicating its effective PM emissions rates is about 0.1 lb/MMBtu (as described below).

Yet even as residential wood-burning is increasingly recognized as a threat to air quality and health, (and the impact of even a single woodstove is understood by people who live in wood-burning areas), commercial bioenergy is still promoted as “clean” energy. EPA has a program to reduce emissions from residential wood-burning,⁸ but other actions by the Agency have actually increased the potential for industrial and commercial biomass burning to emit dangerous levels of pollution. Complementing widespread promotion of biomass energy by the Department of Agriculture and the Forest Service,⁹ EPA’s regulations governing pollutant emissions from commercial and industrial biomass boilers are notably permissive, and allow greater use of contaminated and chemically treated wood as fuel.¹⁰ At the state level, permits allowing the use of waste as fuel are granted with little or no public input, creating exceptions of dubious legality.

Improving air quality requires reducing emissions from polluting facilities, and reducing emissions often requires local involvement in air permitting. The goal of this project is to enable such involvement. To update information from the 2012 bioenergy report, and make information more available to policymakers and the public, we created an online database and map of biomass-burning and wood-pellet manufacturing facilities in Pennsylvania, available at <http://www.pfpi.net/bioenergy-in-pennsylvania>. The database and summary statistics presented in this report are drawn from that database.

Our Approach

To update the database on bioenergy facilities we assembled for the 2012 report, we searched the Pennsylvania Bulletin,¹¹ the state’s online gazette of information and rulemaking, for recent references to air pollution permits issued to facilities with wood-fired or biomass-fired boilers. We collected all information that the Pennsylvania Bulletin provided for each facility (this varies between facilities – see discussion below) and entered it into a spreadsheet. We divided the population of biomass burners by sector (industrial, commercial, institutional, and power plants) collecting information on boiler size, pollution controls, and pollutant emissions. We noted the dates of permit issuance, and calculated when permits would undergo their periodic five-year renewal, which is an opportunity for the public to comment on permits and request improvements.

Our approach did not capture all the commercial facilities burning wood for energy in Pennsylvania, but only those listed in the Pennsylvania Bulletin in the last several years. In fact, another database and map of wood-burning facilities, the “Wood2Energy” database, lists a number of other “wood energy users” in Pennsylvania, facilities we were unable to find listed in the Pennsylvania Bulletin. We discuss the implications of this below.

⁸ E.g., <http://www2.epa.gov/residential-wood-heaters>

⁹ E.g., <http://www.fs.fed.us/woodybiomass/>

¹⁰ For a discussion of how EPA’s “boiler” and “waste” rules will increase toxic pollutant emissions from biomass burners, see our report “Trees, Trash, and Toxics: How Biomass Energy Has Become the New Coal,” at <http://www.pfpi.net/wp-content/uploads/2014/04/PFPI-Biomass-is-the-New-Coal-April-2-2014.pdf>.

¹¹ <http://www.pbulletin.com/>

The Context for Bioenergy Pollution: Air Quality and Asthma Rates in Pennsylvania

The impact of pollution from any given facility will depend in part on background air quality and the health status of the affected population. In Pennsylvania, EPA's "Green Book"¹² currently designates many counties as failing to meet the National Ambient Air Quality standards for particulate matter (Figure 1a) and ozone (Figure 1b), and two counties, Berks and Beaver, are out of attainment with EPA's lead standard.

Figure 1a shows county-level attainment status with the 2006 PM_{2.5} standard, with all counties¹³ in grey failing on the basis of not meeting the 24-hour PM_{2.5} standard of 35 µg/m³. In addition, EPA has indicated¹⁴ that it intends to designate Allegheny, Delaware, Lebanon, Lehigh, and Northampton counties, as well as parts of Cambria and Indiana counties, as in non-attainment for the 2012 annual PM_{2.5} standard of 12 µg/m³, which replaced the 2006 annual standard of 15 µg/m³. Particulate matter health standards set in the United States are still not as protective as the standards recommended by the World Health Organization, which are 10 µg/m³ for the annual standard and 25 µg/m³ for the 24-hr standard.

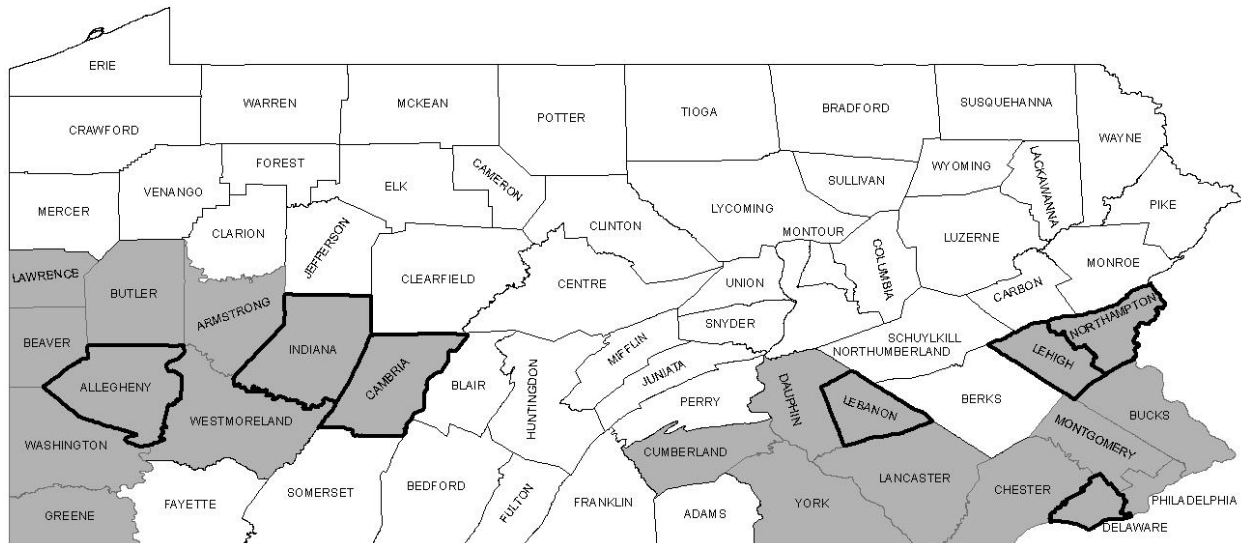


Figure 1a. County-level attainment status for EPA's 2006 24-hr PM_{2.5} standard of 35 µg/m³; grey indicates non-attainment. Allegheny, Armstrong, Greene, Indiana, and Lawrence counties are in partial non-attainment. Counties with bold outlining are also in whole or partial non-attainment with the 2012 PM_{2.5} annual standard of 12 µg/m³.

Figure 1b shows EPA's current designations for counties in non-attainment with the 2008 ground-level ozone standard of 0.075 parts per million. Ozone levels have however been decreasing; recent data on three-year monitoring averages collected by the Pennsylvania DEP suggest that the state may be is on

¹² http://www.epa.gov/airquality/greenbook/phistory_pa.html.

¹³ http://www.epa.gov/airquality/greenbook/dv_pm25_notes.html

¹⁴ U.S. Environmental Protection Agency. Pennsylvania: Johnstown, Delaware County, Allegheny County, Allentown, and Lebanon Nonattainment Areas. Area Designation for the 2012 Primary Annual PM_{2.5} National Ambient Air Quality Standard Technical Support Document. Available at <http://www.epa.gov/pmdesignations/2012standards/state.htm>.

track to attain the 2008 ozone standard by 2015, with a 2014's relatively cool and wet summer helping limit exceedances of the health standard.¹⁵ Such progress is not immediately reflected in EPA's data.

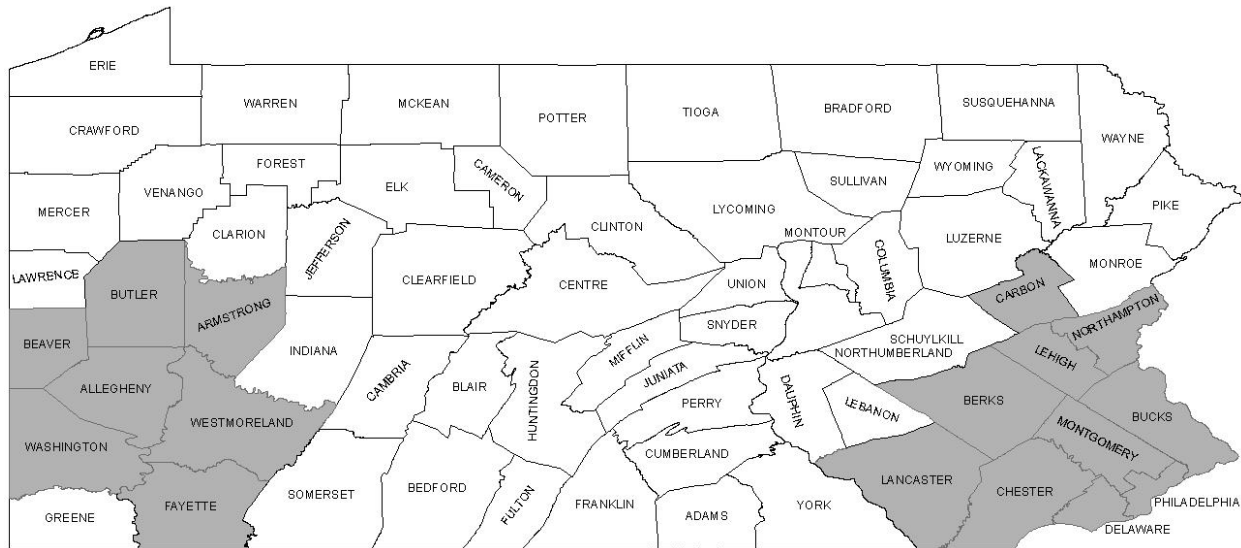


Figure 1b. County-level attainment status for for EPA's 2009 8-hr ozone standard of 0.075 ppm. Grey indicates non-attainment.

Asthma rates in Pennsylvania students are relatively high; about 80% of counties in the state reported rate above 8% (Figure 2).¹⁶

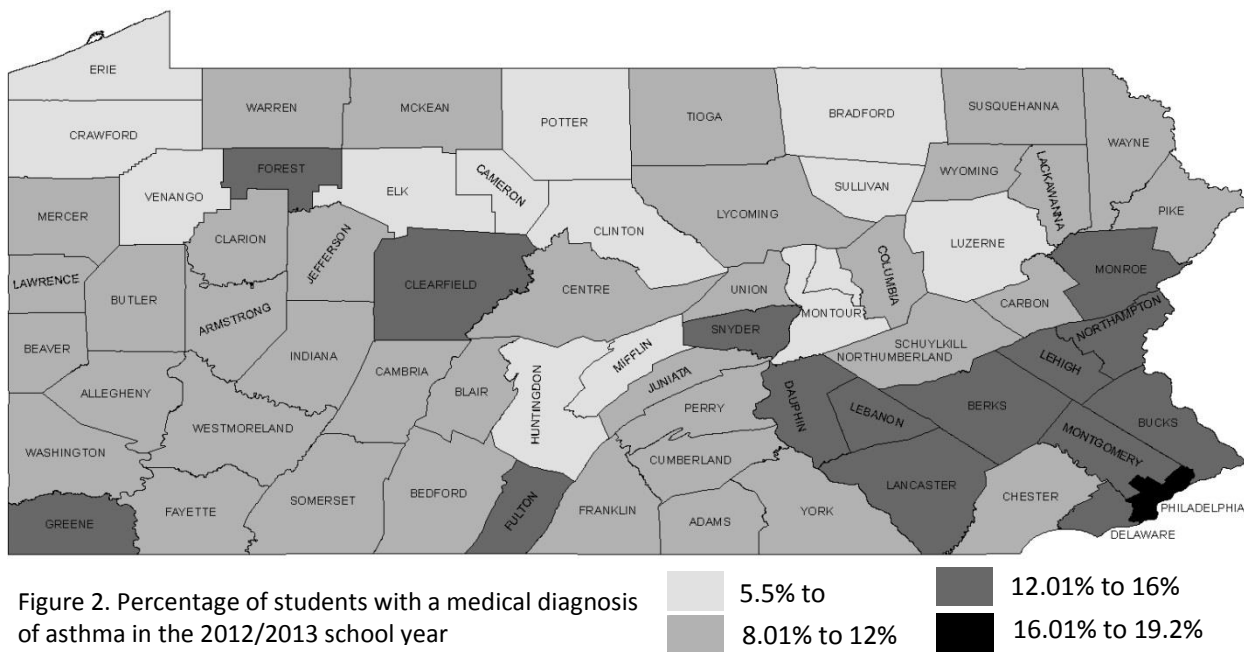


Figure 2. Percentage of students with a medical diagnosis of asthma in the 2012/2013 school year

5.5% to 8.0%
8.01% to 12%
12.01% to 16%
16.01% to 19.2%

¹⁵ Ambient Air Quality Update to the Air Quality Technical Advisory Committee of the Pennsylvania DEP, October 9, 2014.

¹⁶ Asthma data are from Pennsylvania Department of Health, "Students with medical diagnosis of asthma by health district, county and educational institution" 2012/2013 school year. These data may be obtained at <http://www.portal.state.pa.us/portal/server.pt> by searching on "Students with medical diagnosis of asthma." The data are reported yearly by schools.

While poor air quality is known to be an exacerbating factor for asthma,¹⁷ this report does not attempt to link asthma rates to outdoor air quality or facility emissions – to do so requires detailed epidemiological studies that are far beyond the scope of this report. However, Pennsylvania’s high asthma rate for students provides a backdrop for public policy decisions that promote bioenergy and can consequently increase local air pollution, often in places that are nowhere near the monitoring sites where the Pennsylvania DEP collects data that determine whether the state is meeting EPA’s air quality standards.

Triggering Thresholds for Air Permitting in Pennsylvania

Facility operating permits set conditions for a facility’s hours of operation, types of fuels, emission controls, and emissions rates. In Pennsylvania, bioenergy and other facilities with emissions may be required to get a state-only operating permit, a Federal “Title V” permit, or no permit at all, depending on the size of the burner and the amount of pollution it is likely to emit. Thresholds triggering the requirement for a Federal Title V permit, which are usually more protective than State permits, are the potential to emit¹⁸ 100 tons of a criteria pollutant or 50 tons of volatile organic compounds (VOCs). The threshold is 25 tons of VOCs or nitrogen oxides (NO_x) in areas where the non-attainment status for ozone is severe. Title V permitting is also triggered if a facility is a “major” source for hazardous air pollutants (HAP).¹⁹ Some facilities may artificially constrain their potential to emit by agreeing to limit hours of operation, or by taking other restrictions, in order to avoid the Title V permitting program. Such facilities are called “synthetic minor” sources.

The next step down from a Title V permit is a state-level permit. A state-level permit is required only if a facility has *actual* emissions above the following thresholds, in tons per year:

CO	20 tpy
NO _x	10 tpy
SO _x	8 tpy
PM10	3 tpy
VOCs	1 tpy
Single HAP	1 tpy
Multiple HAPs	2.5 tpy

Table 2. Emissions thresholds that trigger state-level air permitting in Pennsylvania.²⁰

Facilities self-reporting as emitting less than the state’s thresholds are not required to get permits at all, even if there are multiple such sources in an airshed. “Minor” source facilities that avoid Title V permitting, either because they are true minor sources or synthetic minor sources, can be built anywhere in the state, often when background air quality is already degraded. In some cases, owners of a facility that was built without an initial permit may add to it over time, increasing its emissions but still escaping permitting. Actual emissions testing may be scant to non-existent at many facilities.

¹⁷ Pennsylvania Department of Health. 2012 Asthma Burden Report.

http://www.portal.state.pa.us/portal/server.pt/document/1281643/2012_asthma_burden_report_pdf

¹⁸ Potential to emit (PTE) is the amount of pollution a facility would emit if operated full-time at its permitted rate.

¹⁹ Major source status is triggered by a facility emitting more than 10 tons of one HAP or 25 tons of multiple HAPs.

²⁰ Document “Air Quality Permit Exemptions” available from the Pennsylvania DEP at <http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-8629>

Summary of Bioenergy and Pellet-manufacturing Facilities in Pennsylvania

Our review of bioenergy facilities listed in the Pennsylvania Bulletin found:

- 101 facilities that were identified as wood or biomass burning boilers or rotary dryers at pellet mills. One pellet mill exclusively used natural gas for drying its pellets.
- More than 70% of the units (73) were industrial biomass burners or rotary pellet dryers providing process heat at lumber mills, veneer plants, and pellet mills. There were 10 pellet plants in this group. These facilities tend to have one or more biomass burners ranging from less than 10 MMBtu/hr to 50 MMBtu/hr in capacity.
- Three large facilities are power generating facilities, and we classified 4 as industrial/power generation because they generate both process heat and electricity. These facilities have boilers that are over 200 MMBtu/hr in capacity, and burn a variety of fuels.
- We classified 17 boilers as institutional because they were located or proposed at schools and other public institutions. Twelve of these were located at elementary or high schools; others were at a university campus, two hospitals, a health center, and a prison.

The facilities we identified as receiving permits from the Pennsylvania DEP do not represent all the facilities burning wood for energy in Pennsylvania. The most recent version of the “Wood2Energy” database,²¹ an online listing of wood-burning facilities for each state, lists 75 facilities using biomass energy and/or producing pellets in Pennsylvania (the previous version listed 1,643 facilities; no explanation is given for this discrepancy). It is notable that the most recent version lists several facilities that are not found in the Pennsylvania Bulletin, suggesting that many facilities may be self-classifying as not emitting enough pollution to require a state-level operating permit.

Almost all the biomass burners we found in the Pennsylvania Bulletin are relatively small. For the 68 facility listings in the Pennsylvania Bulletin for which the boiler capacity can be obtained in units of MMBtu/hr (Figure 3), the majority are in the 10 - 30 MMBtu/hr range. However, despite the relatively small size of many biomass burners, their emissions can be significant. Pennsylvania law does not require the most effective pollution controls to be used at biomass-burning facilities. None of the smaller facilities use any controls for NO_x. To control particulate matter, the largest facilities are generally required to use a baghouse or an electrostatic precipitator, but for most small to medium sized burners, the State only requires use of a cyclone or multi-cyclone, devices that use centrifugal force to spin out the largest particles but which do little to reduce emissions of PM_{2.5} and smaller size fractions that are most implicated in health effects.²² The fact that emissions standards are based on the mass of particulate matter emitted, rather than the number of particles, obscures the fact that a mass of smaller particles may have orders of magnitude greater surface area – and hence greater capacity to invade and interact with lung tissue – than an equivalent mass of larger particles. It is the interaction of particle surfaces with the lungs that makes these particles so toxic, particularly as they convey carcinogenic heavy metals and carbon-based compounds.

²¹ <http://www.wood2energy.org/>

²² See our 2012 report “Biomass Energy in Pennsylvania: Implications for Air Quality, Carbon Emissions, and Forests” for a more detailed discussion of pollution impacts and emission controls. At http://www.pfpi.net/wp-content/uploads/2012/12/PFPI-PA-Biomass-Energy-Report_12_18_12.pdf

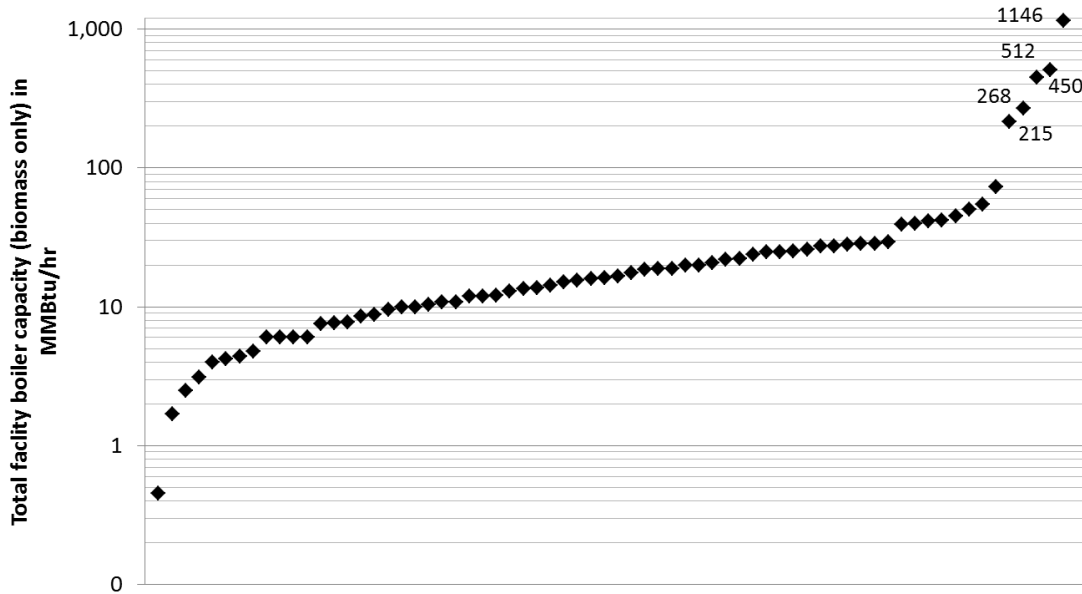


Figure 3. Capacity (in MMBtu/hr) for biomass-fueled boilers and rotary dryers for which the Pennsylvania Bulletin provides information on boiler size. Each dot represents combined biomass-burning capacity at a single facility, so a dot may represent more than one unit at a facility.

In Pennsylvania, the Department of Environmental Protection typically limits PM emissions rates from biomass boilers employing cyclonic control devices to around 0.22 lb/MMBtu, which is about ten times higher than the rate that could be achieved using a baghouse or electrostatic precipitator for particulate matter control. However, some plants are explicitly permitted with even higher emissions rates. For instance, permitted PM emissions from the wood-fired boiler at the Oak Hill Veneer plant in Bradford County are set at 0.3 lb/MMBtu, as are PM emissions at the biomass boiler at Clearfield Middle School in Clearfield County.

At a particulate matter emissions rate of 0.22 lb/MMBtu, potential emissions at full-time operation are close to one ton of particulate matter per MMBtu of boiler capacity,²³ meaning that even a relatively small 20 MMBtu boiler such as that located at a sawmill is permitted to emit around 20 tons of PM per year. As facilities are specifically exempted from complying with particulate matter emissions rates during startup and shutdown, events that can take several hours, actual emissions may be higher than the “potential to emit” may indicate. However, they can also be lower. For instance, the permit limit for PM emissions from the 400 HP (13.4 MMBtu/hr) Matson Lumber facility in Jefferson County is 16.6 tons per year (about 0.28 lb/MMBtu), but the Pennsylvania Bulletin entry for the facility’s 2014 permit renewal²⁴ states that actual emissions at the facility, based on recent stack tests, are 5.78 tons per year (translating to an emissions rate of about 0.1 lb/MMBtu). However, since stack tests are generally conducted when a facility is operating at optimal conditions, this estimate may not represent the emissions from startup and shutdown or other times when emissions rates increase.

In permits written by the Pennsylvania DEP, emission control requirements are almost always minimal, compared to what is possible using readily available technology. For the 61 facilities for which the Pennsylvania Bulletin mentions emissions controls, all but 8 use only cyclones or multi-cyclones for

²³ 0.22 lb/MMBtu x 1 MMBtu/hr x 8,760 hr/yr = 1,927.2 lb/yr

²⁴ <http://www.pabulletin.com/secure/data/vol44/44-29/1498d.html>

particulate matter control, and some of the smallest facilities do not appear to be using any particulate matter controls at all. Even for biomass boilers installed at schools, where students are effectively a "captive" population exposed to woodsmoke emissions during the school day, the State has not required anything more than a multicyclone for PM emissions control. However, the Pennsylvania DEP did require an electrostatic precipitator for PM control at the State Correctional Institute at Cresson when that institution decided to install a biomass boiler, and the relatively low level of permitted PM emissions at the Evangelical Community Hospital (3.25 tons per year for a 24.7 MMBtu/hr boiler) indicate that this facility also uses a baghouse or an electrostatic precipitator, although information on required controls is not provided in the Pennsylvania Bulletin.

In contrast to Pennsylvania, some states are requiring use of better emissions controls for small-scale bioenergy facilities. For instance in New York, the State's "Cleaner, Greener Communities" program requires commercial biomass burners installed under the program to meet a number of requirements, among them a PM emission rate of no more than 0.08 lb/MMBtu, with a rate of 0.03 lb/MMBtu at all institutions such as schools, health care facilities, nursing homes, or "locations with similar sensitive populations."²⁵

Emissions from burning contaminated materials such as demolition waste can further increase risks to human health, but few protections exist at the federal and state level to restrict the use of such materials as biomass fuel. Recent actions by the EPA have actually increased the likelihood that contaminated materials may be burned as biomass, as new standards simply require that biomass fuels not be more contaminated than coal, but do not require actual testing of fuels for contamination.²⁶ We did not determine if permits issued by the Pennsylvania Department of Environmental Protection (DEP) offer real protections against use of contaminated fuels, because Pennsylvania Bulletin entries were often silent on this matter. Some entries contain provisions restricting wood use to uncontaminated wood, and state that the facility should be ready to provide fuel samples to DEP upon request. However, it is unclear whether the Pennsylvania DEP actually tracks and consistently tests contamination in fuels at particular facilities. Further, given that approval of facility permits by the Pennsylvania DEP appears routine, and given that many facilities have relatively old permits that probably do not restrict the kinds of materials burned, it seems likely that some bioenergy facilities are burning waste wood that can emit high concentrations of air toxics such as arsenic, lead, benzene, formaldehyde, and other compounds found in demolition waste.

Certain facilities are notable for the large amount of pollution that they are allowed to emit. Out of the 101 biomass-burning facilities in the database, more than one-third (38) are permitted to emit more than 50 tons of at least one pollutant, or are identified as Title V or state-only synthetic minor permits with no data on emissions provided in the Pennsylvania Bulletin. Some of the most potentially polluting facilities have the least information available in the Pennsylvania Bulletin – for instance, the Bulletin's announcement for permit reissuance at Domtar's Johnsonburg Mill in Elk County contains no information on emissions or pollution controls, even though the facility burns black liquor and is permitted for multiple large boilers, papermaking operations, and a chemical recovery furnace.²⁷

²⁵ The biomass guidance is available at <http://www.nyserda.ny.gov/Governor-Initiatives/Cleaner-Greener-Communities/Implementing-Smart-Development-Projects/Guidance-Documents.aspx>

²⁶ For a discussion of how EPA's "boiler" and "waste" rules will increase toxic pollutant emissions from biomass burners, see our report "Trees, Trash, and Toxics: How Biomass Energy Has Become the New Coal," at <http://www.pfpi.net/wp-content/uploads/2014/04/PFPI-Biomass-is-the-New-Coal-April-2-2014.pdf>.

²⁷ <http://www.pabulletin.com/secure/data/vol41/41-18/726c.html>

Wood pellet manufacturing facilities are also notably polluting. Not only do wood-fired rotary pellet dryers emit particulate matter, but so do the other milling operations, especially the hammermill that pulverizes wood to make pellets. Pellet mills typically use a baghouse to control PM emissions from milling operations, but rotary dryers and other biomass-burning appliances usually only employ a multi-cyclone to control PM emissions. Total facility emissions can be significant – for instance, permitted particulate emissions from the “Greene Team” facility in Greene County, which has a 26 MMBtu/hr wood-fired rotary dryer, are 37.2 tons per year.

The Costs of Bioenergy Pollution in Pennsylvania

Proliferation of polluting bioenergy facilities in Pennsylvania is occurring in the context of existing air quality problems and associated health effects. Pollution has a cost, in terms of environmental effects (crops and forests nationwide sustain billions of dollars in damage from ground-level ozone each year) and human health, where multiple impacts ranging from low birth weight to cancer have been linked to poor air quality.

Such impacts can be expressed in financial terms. It is well-established that the effects of additional air pollution loading are worst in areas that are already suffering from degraded air quality.²⁸ One analytic tool for determining financial impacts of pollution, developed with EPA support, is the Air Pollution Emission Experiments and Policy Analysis (APEEP) model.²⁹ This model assesses the marginal cost of each additional ton of pollution emitted, calculating separate county level cost estimates that weight marginal costs by existing emission sources, and thus by extension background air pollution.³⁰

Of the pollutants modeled by the APEEP model, the greatest marginal costs are associated with PM_{2.5}, the size fraction of particulate matter that is emitted in the greatest quantities by wood-burning.³¹ Employing the standard assumption that the “value of a statistical life” is \$6 million, the APEEP model finds that Pennsylvania, as a state with existing air quality problems, has counties with some of the highest marginal costs of pollution in the nation (Figure 4).

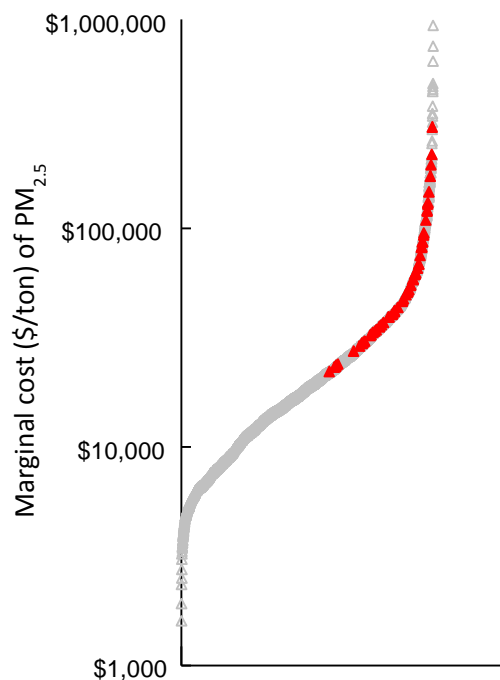


Figure 4. Distribution of marginal cost estimates for all counties in the United States as calculated using the APPEP model. Counties in Pennsylvania are shown in red.

²⁸ U.S. Environmental Protection Agency. National Air Toxics Program: The Second Integrated Urban Air Toxics Report to Congress. Office of Air Quality Planning and Standards, Research Triangle Park, NC. June 21, 2014.

²⁹ <https://sites.google.com/site/nickmullershomepage/home/ap2-apeep-model-2>

³⁰ Of course, the model characterizes average impacts and does not characterize the dramatic financial impact that sudden onset of respiratory disease or cancer can represent to an individual.

³¹ PFPI’s 2012 report provides background on the different types of pollution emitted by biomass-fueled burners. At http://www.pfpi.net/wp-content/uploads/2012/12/PFPI-PA-Biomass-Energy-Report_12_18_12.pdf

EPA employs a similar approach to calculate the financial benefits of reductions in emissions of particulate matter and other pollutants from “major source” and smaller “area source” boilers that are anticipated to occur because of new restrictions on emissions from boilers.³² Of the area source boilers regulated under the new rules, 21% are biomass-fueled, a significant portion of regulated units nationally. The benefits associated with reducing PM_{2.5} emissions from area source boilers are estimated to be between \$110,000 and \$290,000 per ton reduced, depending on assumptions, but these are average values and do not vary by county as do the APEEP estimates. The midpoint of the EPA estimates (\$200,000) is higher than the value produced by averaging county-level APEEP estimates, meaning that the APEEP estimates are relatively conservative.

Estimating the marginal cost for excess emissions of particulate matter is appropriate for biomass energy facilities that are allowed to emit more than ten times the pollution they would emit if they installed effective emissions controls for PM. While electrostatic precipitators and baghouses do not control PM_{2.5} completely, they are far more effective than the cyclonic technologies now employed at most Pennsylvania bioenergy facilities, which do very little to reduce PM_{2.5}. In the absence of a detailed epidemiological study, it is of course impossible to connect emissions from a particular facility to health impacts. However, the general connection between degraded air quality and health impacts is not in dispute. The following are some examples, calculated using the APEEP county-level cost estimates, of how reducing facilities’ PM_{2.5} emissions by just ten tons per year could avoid significant costs to the environment and human health. In each case, using the midpoint of EPA’s cost estimates for PM_{2.5}, the avoided costs of reducing emissions under the EPA model would be \$2 million.

Esbenshades Greenhouses, Lancaster County

This is a combined heat and power biomass burner located in Lancaster County, which is currently failing to meet EPA’s 8-hr ozone standard and the 24-hr PM_{2.5} standard.³³ The prevalence of asthma in students is 13.64%, above the state’s average, with 10,095 children reported as having asthma in the 2012/2013 school year. The Pennsylvania Bulletin states that actual PM emissions from the Esbenshades facility are 38.1 tons per year.³⁴ The state gave the company \$474,502 in Energy Harvest funds for installation of a new biomass boiler, but nonetheless still only required a multi-cyclone for PM control. The marginal cost for PM_{2.5} in Lancaster County using the APEEP model is \$92,994 per ton, suggesting that eliminating 10 tons of the “excess” PM emitted by this facility by requiring more effective PM controls could avoid air pollution costs of \$929,940 per year.

Bloomsburg University, Columbia County

This boiler was installed on the campus of Bloomsburg University in Columbia County, which is currently in non-attainment with EPA’s one-hour standard for ground-level ozone. The biomass boiler installation was granted \$500,000 in Energy Harvest funds by the state. Despite being located on a university campus with a high potential for exposure, the facility was allowed to go forward using just a multi-cyclone for PM control and with an allowable emissions rate of 0.2 lb/MMBtu, about ten times higher than would be achieved with a baghouse or electrostatic precipitator. Allowable PM emissions are 19.44 tons per year. The marginal cost for PM_{2.5} in Columbia County is \$52,392 per ton using the APEEP

³² U.S. Environmental Protection Agency. Regulatory Impact Analysis: National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters. February, 2011. Available at <http://epa.gov/airquality/combustion/docs/boilerreconfinalria121220.pdf>

³³ http://www.epa.gov/airquality/greenbook/phistory_pa.html

³⁴ <http://www.pabulletin.com/secure/data/vol44/44-24/1255a.html>

model, suggesting that over \$500,000 in pollution-related health and environmental costs could be avoided if this facility reduced PM emissions by ten tons per year.

Ernst Biomass, Crawford County

This facility is a proposed pellet manufacturing plant that would use a wood-fired rotary dryer in the pelletization process. The facility has received multiple extensions of its construction permit but does not appear to be operational yet. The company received \$1.33 million in total assistance, including a \$900,000 grant from the Pennsylvania Energy Development Authority. While the biomass burner would only have a capacity of 16 MMBtu/hr, the facility's permit allows emissions of 31.5 tons of PM per year. As the marginal cost of PM_{2.5} in Crawford County is \$49,773 per ton using the APEEP model, rewriting the permit to reduce emissions by ten tons a year at this facility could avoid almost \$500,000 in health and environmental costs per year.

Gutchess Hardwoods, Westmoreland County

This facility is a large emitter located about two tenths of a mile from densely packed residences and 0.8 of a mile from the Latrobe elementary school. Westmoreland County is in non-attainment for EPA's 8-hr ozone standard and the PM_{2.5} standard. The facility's three biomass boilers and sawmill operations are permitted to emit 57 tons of PM per year; the facility is also permitted to emit almost 100 tons of carbon monoxide per year, suggesting it might be more appropriately permitted under the Title V program. While the DEP announced a notice of intent to issue the air permit in 2012,³⁵ there is no final notice of the air permit actually being issued in the Pennsylvania Bulletin. Under the APEEP model, marginal emissions of PM_{2.5} are valued at \$130,883 per ton in Westmoreland County, thus reducing emissions at this facility by just ten tons could avoid around \$1.3 m per year in health and environmental costs associated with air pollution.

United Corrstack/Evergreen Community Power, Berks County

The Evergreen Community Power facility in Reading is a 33 MW facility that burns a variety of wood debris and other waste materials. The facility is located in a densely populated area of Reading, in Berks County, which is in non-attainment for EPA's 8-hr ozone standard. Berks County had a student asthma prevalence in 2012/2013 of 13.5% (9,621 children). Despite the heavily polluted nature of its surroundings, the company received a cash grant of \$39 million in Federal funds to install the biomass boiler. The facility was permitted as a synthetic minor for both criteria pollutants and hazardous air pollutants to avoid Title V permitting, but has had a variety of problems meeting its emissions limits. A Department of Energy evaluation determined that the project was losing around \$15 million per year in 2010 and 2011 (for more details on the Evergreen facility, see our report "Trees, Trash, and Toxics: How Biomass Energy Has Become the New Coal"³⁶).

Evergreen Community Power's state-only operating permit allows 96 tons of particulate matter emissions per year. While the facility does use an electrostatic precipitator for PM control, emissions could be reduced if the facility used a high-efficiency baghouse, which would serve the additional purpose of reducing emissions of heavy metals from the treated wood that is burned at the facility (Berks County, along with Beaver County, is also partially in non-attainment for the EPA inhalable lead health standard³⁷). As the APEEP model values the marginal cost of PM_{2.5} at \$ 95,231/ton in Berks County, reducing PM emissions by ten tons could avoid almost \$1 m in pollution costs per year.

³⁵ <http://www.pabulletin.com/secure/data/vol42/42-31/1460a.html>

³⁶ At <http://www.pfpi.net/wp-content/uploads/2014/04/PFPI-Biomass-is-the-New-Coal-April-2-2014.pdf>.

³⁷ <http://www.epa.gov/airquality/greenbook/mnacs.html#PENNSYLVANIA>.

Outcomes for State Subsidies Given to Bioenergy

As we documented in our 2012 report, in the mid-to-late 2000's, Pennsylvania allocated over \$30 million in state energy grants and loans to promoting small-scale bioenergy, with most of these resources derived from Federal Stimulus funds.³⁸ One facility, Evergreen Community Energy, additionally received a single Federal grant of \$39 million. However, bringing even a small biomass energy project to completion can be complicated and expensive. Although many projects were promoted in recent years based on the idea that replacing oil heat with wood would save a great deal of money, these cost savings may have diminished in importance as natural gas has become more abundant in recent years. For this report, we scrutinized the Pennsylvania Bulletin and other sources to determine the fate of facilities receiving grants and loans. Table 3 summarizes these findings.

County	Facility	Grants and loans	Total	What happened with the facility?
Ethanol				
Clearfield	Helios Scientific LLC	\$2m from Redevelopment Capital Assistance Program	\$ 2,000,000	No evidence this facility exists
Industrial				
Berks	Evergreen Community Power and United Corrsstack	\$39 million in stimulus funds; \$250,000 from PEDAs	\$ 39,250,000	Facility was built; many problems with emissions controls; losing \$15m per year according to DOE
Bradford	Craftmaster	\$1.358 m in stimulus funds	\$ 1,358,868	Acquired by Jeld-Wen; operating permit reissued Feb, 2014
Clarion	Piney Creek Limited Partnership	\$429,599 (ARRA) \$442,648 (Other)	\$ 872,247	Title V permit reissued Sept 2012
Northumberland	IntelliWatt Renewable Energy	\$4.98 million loan from Alternative and Clean Energy program; PEDAs grant of \$150,000	\$ 5,130,000	No evidence that this facility exists
Pellet manufacturing				
Adams	Penn Wood Products, Inc.	\$973,035 from the Adams County Economic Development Corporation	\$ 973,035	No evidence that this facility exists
Bradford	Barefoot Pellet Company	\$469,200 from PEDAs	\$ 469,200	Still no permit, but exists
Carbon	Great American Pellet/Keystone	\$770,000 in loans, \$220,000 alternative energy grants, \$80,850 job training funds	\$ 1,000,850	No permit, last action in 2009
Crawford	Ernst Biomass LLC	PEDAs grant of \$900,000; total assistance \$1,336,929	\$ 1,336,929	Plan approval extension June 2014, no permit
Fayette	Tri State Biofuels	\$716,500 loan and \$360,000 grant	\$ 1,076,500	Plan approval (construction permit) extension Sept 2013; no permit
Juniata	Energen Pellet Fuel, Inc.	\$525,000 loan; \$150,000 grant from Alternative and Clean Energy fund	\$ 675,000	Operating permit renewal issued June 2011
McKean	American Refining & Biochemical	\$1 m from PEDAs	\$ 1,000,000	No evidence that this facility exists
Potter	PA Pellets, LLC	PEDAs grant of \$325,000	\$ 325,000	Permit issued June, 2011
Somerset	First Nation Wood Pellet	\$500,000 from PEDAs	\$ 500,000	No permit issued
Union	Biomass Fuel Stocks of PA Inc.	\$152,000 from PEDAs	\$ 152,000	No evidence of permit

³⁸ As identified above, one large-scale biomass/waste burner, the United Corrsstack/Evergreen Community Power facility in Berks County, received \$39 million directly from the Federal government as a Treasury grant.

County	Facility	Grants and loans	Total	What happened with the facility?
Institutional Bradford	Wyalusing School District	\$310,000 Energy Harvest Grant	\$ 310,000	Operating permit issued March 2013
Bradford	Northeast Bradford School District	\$905,000 loan from Alternative Energy Investment Fund	\$ 905,000	Operating permit issued Dec 2013
Cambria	Glendale School District	\$350,000 from Energy harvest and Alternative Fuels Incentive Grant program	\$ 350,000	No evidence of permit
Centre	Penns Valley Area School District	\$788,956 in stimulus funds; \$868,959 grant from PEDA	\$ 1,657,915	Plan approval extension (construction permit) granted May, 2014
Clearfield	Clearfield Middle School	\$600,000 in federal funds some years ago	\$ 600,000	Operating permit renewed Dec. 2010
Clearfield	Nydree Flooring	\$270,000 from PEDA	\$ 270,000	Operating permit issued Nov 2012
Columbia	Benton Area School District	Two PEDA grants, each \$350,000	\$ 700,000	Operating permit issued Dec. 2011
Columbia	Dillon Floral Corp	\$207,000 Energy Harvest Grant	\$ 207,000	Operating permit issued Aug.2013
Columbia	Bloomsberg University	\$500,000 Energy Harvest Grant	\$ 500,000	Title V permit renewed April 2013
Crawford	Crawford Central School District	\$500,000 Energy Harvest Grant from state	\$ 500,000	Operating permit issued Aug. 2013
Elk	Elk Regional Health System	\$300,000 USDA loan; \$1,475,000 rural development loan; \$500,000 from PEDA; \$250,000 woody biomass utilization grant	\$ 2,525,000	Now called Penn Highlands; operating permit issued July 2014
Lancaster	Esbenshades Greenhouses, Inc	\$474,502 Energy Harvest funds	\$ 474,502	Intent to issue operating permit Nov, 2010; no evidence of actual permit
Lycoming	East Lycoming School District	PEDA grant of \$915,476	\$ 915,476	Operating permit issued June 2013
McKean	Smethport	\$25,000 from Community Fund for the Alleghenies, \$50,000 from Richard King Mellon Found	\$ 75,000	No evidence of permit
McKean	Kane Area School district	\$250,000 from USDA Woody Biomass Utilization program; \$355,653 from Energy Harvest Program	\$ 605,653	Operating permit issued June 2014
Northumberland	Kurt Weiss Greenhouses of PA Inc	\$959,500 loan from Alternative and Clean Energy program	\$ 959,500	No evidence this boiler was installed
Schuylkill	Schuylkill County Agricultural Facility	\$346,822 Energy Harvest grant	\$ 346,822	No evidence this boiler was installed
Snyder	Windview Farm	\$61,356 from Energy Harvest and Alternative Fuels Incentive Grant program	\$ 61,356	No evidence of permit
Somerset	International Conservation Center	\$267,000 Clean Energy Grant from Dept of Community and Economic Development; \$375,000 from Richard King Mellon Foundation	\$ 267,000	No evidence of permit
Sullivan	Sullivan County School District	\$630,000 from PEDA; \$200,000 USDA state and private forestry grant	\$ 830,000	Plan approval (construction permit) extension granted Jan 2014
Union	Evangelical Community Hospital	\$800,000 grant from Alternative and Clean Energy program	\$ 800,000	Operating permit issued April 2014

Table 3. Funding allocated to bioenergy and pellet manufacturing in Pennsylvania as reported in PFPI's 2012 "Bioenergy in Pennsylvania" report, and the current status of those facilities. A statement that there is "no evidence" for a facility means that we did not find reference to it in the Pennsylvania Bulletin or on the internet.

Overall, we found that a number of the companies receiving state support have not yet moved forward with their construction, and some apparently no longer exist as companies. Some companies do still exist, but have not yet received an operating permit. In all, 19 out of the total 38 facilities that received support either no longer exist or have not yet received an operating permit (shaded in grey). It is not clear what has happened to funds allocated to these ventures, or if all were indeed allocated.

How Citizens Can Help Reduce Bioenergy Air Pollution in Pennsylvania

Under the lax permitting requirements in Pennsylvania, facilities burning biomass are allowed to emit pollution at higher rates than they would if modern pollution control technologies were required. Virtually all pollution controls implemented at the biomass burners listed in the Pennsylvania Bulletin are old technologies. Pollution control manufacturers are innovating on many levels, with mini-electrostatic precipitators and advanced combustion chambers that minimize the amount of PM emitted. Unfortunately, the way Best Available Control Technology (BACT) standards are administered creates a negative feedback loop, reinforcing the use of old technologies, because BACT is based in great part on a review of existing, implemented technologies in order to determine what technology is most widely available for new installations. As cyclonic devices are by far the most widespread in Pennsylvania, newer technologies are not even considered *because they are not already installed*. This absurdity has perpetuated to the point where pollution control technology advancement has stagnated as the negative feedback loop ripples into the economics of technology availability, artificially inflating the prices of these devices and ensuring their painfully slow adoption.

Public involvement can help. Improving air quality requires reducing emissions, and reducing emissions requires installing emissions controls at polluting facilities and ensuring they are operated correctly. Given the number of highly polluting facilities in Pennsylvania and existing lax regulations and standards, the Pennsylvania Department of Environmental Protection is likely to improve air permits only when the public demands that they do so. Bioenergy facilities are especially deserving of public scrutiny because not only do they have the potential to be highly polluting under current Pennsylvania regulation, but bioenergy and wood pellet manufacturing facilities have been the recipients of millions of dollars in state and federal funding, accompanied by relentless propagandizing as “clean energy” in the face of all evidence to the contrary.

Citizen involvement in permitting starts with the Pennsylvania Bulletin, the online resource where Pennsylvania’s regulatory agencies notify the public of regulatory developments. As required by many federal and state laws, including the federal Clean Air Act and Pennsylvania’s Air Pollution Control Act, notices in the Pennsylvania Bulletin must contain certain types of information and must provide the public with the opportunity to comment on proposed regulatory actions, including air quality permits. Submitted public comments *must* be addressed in some way, prior to the final approval of any permit.

Facility operating permits are renewed every five years, and these renewals, along with other alterations in permits, provide an opportunity for the public to comment and request that DEP act to tighten permit requirements at polluting facilities. However, public involvement is stymied by a lack of information in the Pennsylvania Bulletin and the difficulty of obtaining permitting documents and participating in the permitting process. The Pennsylvania DEP still requires that the public physically come in to their offices to view paper copies of permits and other documents, which should be unnecessary in this age when everything can be made available electronically. Another impediment to public involvement is the generally inadequate amount of information posted about air permits in the

Pennsylvania Bulletin, making it difficult for the public to determine whether a facility's permit justifies additional investigation. For instance, while permitting announcements for 71 of the 103 bioenergy facilities we examined contained information on the total tons of PM allowed by the facility's permit, only 20 included information on the PM emissions rate, information that is essential for determining whether a facility is truly using "best available" emissions controls.

Despite these road-blocks, certain organizations have by their own work greatly facilitated public involvement in air permit oversight. Pennsylvania's Clean Air Council is an organization that has used the public comment process to specifically target and improve bioenergy facility permitting, additionally working to uncover lapsed permits and other issues by directly reviewing permit files of biomass facilities. In 2013, Clean Air Council reviewed over two dozen permits of biomass-burning facilities it suspected had lapsed air quality operating permits. In many instances, these facilities had been operating illegally with expired air quality permits, some for months at a time.³⁹ Under the Clean Air Act, many of these facilities could have incurred significant fines for operating illegally. However, the Department of Environmental Protection took minimal enforcement action, instead choosing to work with the violators to quickly renew permits.

Clean Air Council has developed a comprehensive step-by-step guide for public participation in the air quality permitting process for a biomass-burning facility. Located at <http://cleanair.org/sites/default/files/Public%20Participation%20Guide-%20biomass.pdf>, the guide provides detailed steps on using the Pennsylvania Bulletin, example documents that may be found in any air quality permit, how to submit comments on a permit, and even how to conduct a file review. The information we have provided here, and the accompanying online map and database of bioenergy facilities in Pennsylvania, can provide guidance for bioenergy permit reviews on what typical emission rates are, what more protective emission rates look like, and other issues of concern like whether a permit contains restrictions on use of contaminated fuels.

Recommendations

Pennsylvania has many counties that still fail to meet EPA air quality standards, and according to data reported by schools, asthma rates are relatively high. Nonetheless, Pennsylvania's requirements for biomass burners have hardly changed since the oldest, most polluting facilities were put into service. Pennsylvania is not yet close to accounting for the real costs of bioenergy. Bioenergy looks like a bad risk for state funding, as demonstrated by the number of companies that no longer exist even after the State awarded millions in subsidies, but if Pennsylvania does continue to fund bioenergy, it should ensure those funds are used to install modern emissions controls. Moving forward, Pennsylvania should enact rules requiring lower emissions rates at *all* biomass burners, tightening standards beyond compromised federal rules that still allow bioenergy to emit more pollution than coal. Finally, emissions testing at the oldest, most polluting facilities should be a particular priority, and there is a strong need for rules to ensure that toxic wood wastes aren't burned as fuel. These recommendations are just the minimum that, if enacted, would start to reduce pollution risks from this highly polluting industry.

³⁹ See for instance

http://cleanair.org/program/outdoor_air_pollution/biomass/january_9_2013_clean_air_council_issues_notice_intent_sue_nora, and

http://cleanair.org/program/outdoor_air_pollution/biomass/december_3_2012_comments_bloomsburg_university_0