

DIRTY DECEPTION:

How the Wood Biomass Industry Skirts the Clean Air Act



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THE ENVIRONMENTAL INTEGRITY PROJECT

The Environmental Integrity Project (<http://www.environmentalintegrity.org>) is a nonpartisan, nonprofit organization established in March of 2002 by former EPA enforcement attorneys to advocate for effective enforcement of environmental laws. EIP has three goals: 1) to provide objective analyses of how the failure to enforce or implement environmental laws increases pollution and affects public health; 2) to hold federal and state agencies, as well as individual corporations, accountable for failing to enforce or comply with environmental laws; and 3) to help local communities obtain the protection of environmental laws.

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PHOTO CREDITS

Cover photo: Enviva Ahoskie wood pellet mill in North Carolina, courtesy of Dogwood Alliance.

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Executive Summary

Across the U.S. South, industrial-scale “wood pellet” facilities are converting trees into pellets and shipping them to Europe to be burned for electricity. The industry has grown almost 10-fold since 2009, converting millions of tons of trees into pellet fuel for power plants under the mistaken notion that this is carbon neutral and therefore good for the climate. In the midst of this fast growth, relatively little attention has been paid to the high levels of air pollution—such as soot and volatile organic compounds—generated by wood pellet manufacturing, pollution which can lead to a wide array of health and environmental problems. The Environmental Integrity Project (EIP) examined air permits and emissions information in federal and state records for 21 wood pellet mills in the U.S. that are exporting to Europe and found numerous schemes to skirt federal Clean Air Act regulations. EIP’s survey also revealed a troubling record of dangerous fires and explosions, which cause serious episodes of heightened air pollution. EIP focused particular attention on the 15 “new generation” mills constructed since 2008 specifically to supply the international demand for wood pellets. These mills operate on a much larger scale and emit substantially more air pollution than traditional pellet mills that supply a domestic heating market.

Key Findings:

- In 2017, at least a third of the wood pellet plants (7 out of 21) violated their permit limits by releasing illegal amounts of pollution, while another four plants had faulty permits issued by state governments that failed to require pollution control equipment required by the federal Clean Air Act. Overall, more than half of the plants (11 out of 21) either failed to keep emissions below legal limits or failed to install required pollution controls.
- The 21 wood pellet mills exporting to Europe emit a total of 16,000 tons of health-threatening air pollutants per year, including more than 2,500 tons of particulate matter (soot), 3,200 tons of nitrogen oxides, 2,100 tons of carbon monoxide, and 7,000 tons of volatile organic compounds. These plants also emit 3.1 million tons of greenhouse gases annually.
- A factory northeast of Houston owned by German Pellets has emitted nearly ten times its permitted limits of volatile organic compound pollution since it began operation in 2013, releasing 580 tons per year. Rather than require the facility to comply with legal limits, Texas officials are proposing to simply raise the limits to let the facility continue to emit dangerous levels of pollution.
- At the Enviva Biomass wood pellet plant in Southampton County, Virginia, plant operators actually removed the pollution control equipment to evade upgrade

requirements and switched from processing softwood to hardwood, which results in more carbon dioxide pollution and other harmful environmental impacts.

- Of the 15 largest operating facilities, at least eight have had fires or explosions since 2014, including at factories in North Carolina, Georgia, Arkansas, Alabama, and Texas that released vast amounts of air pollution and/or injured employees. A blaze at the German Pellets storage silo in Port Arthur, Texas, burned for two months in 2017, releasing smoke that forced dozens of local residents to seek medical attention and killed a worker during cleanup.

One of the most troubling trends in the wood pellet industry is that facilities that should face the most rigorous air permitting standards are actually the least controlled and dirtiest. Under a Clean Air Act program called “new source review,” new or modified major sources of air pollution are required to reduce emissions to the level achievable by using the best available control technology. Contrary to that legal requirement, states allow construction of the country’s largest wood pellet manufacturing plants without controls, or with inadequate controls, for volatile organic compounds (VOCs), an air pollutant that causes smog and respiratory problems. This is despite the fact that extremely effective VOC controls capable of reducing emissions by 90 to 95 percent are in widespread use at similar wood pellet manufacturing plants. These same controls are also very effective at reducing hazardous air pollutants, which can cause a variety of health effects including cancer. For instance, in North Carolina, wood dryers at two recently permitted major source facilities owned by Enviva Biomass emit nearly six times more VOCs and 50 to 60 times more hazardous air pollutants than comparable facilities with appropriate pollution control systems.

In other instances, states allow facilities to emit well beyond legal limits for years at a time. In Mississippi, Florida, and North Carolina, state permitting authorities continue to allow wood pellet manufacturing plants to emit well above a 250 ton per year threshold for major sources without installing legally required air pollution controls. For example, the Drax plant in Amite County, Mississippi, near McComb, emits more than 900 tons per year of VOCs – more than three times the amount that normally triggers a requirement for the installation of best available pollution control equipment. An Enviva plant in Jackson County, Florida, north of Panama City, emits more than 500 tons per year, and an Enviva plant in Northampton County, North Carolina near Roanoke Rapids emits 377 tons per year. In each of these cases, the Clean Air Act mandates that state permitting authorities require the facility to either reduce its VOC emissions to below 250 tons per year or undergo major source permitting and install the best available control technology. But these states have largely failed to follow the law.¹

Finally, in addition to the air pollution emitted during the manufacturing process directly, pellet mills and storage facilities have experienced a rash of fires and explosions, injuring workers and releasing large amounts of uncontrolled air pollution. Because wood pellets are stored in massive and concentrated piles, these fires can burn for days or weeks. In fact, in the summer of 2017, a fire at a German Pellets in storage facility in Port Arthur, Texas, burned for 52 days, emitting vast amounts of air pollution and sickening nearby residents.

This report calls on state permitting authorities to take these pollution problems seriously and require full compliance with the federal Clean Air Act. In particular, EIP requests that states take the following steps to ensure wood pellet facilities operate legally:

- 1. Reexamine existing air permits in light of new testing that shows much higher emissions of volatile organic compounds and hazardous air pollutants.** If a facility is polluting above legal limits, states must take immediate action to ensure facilities cease violating pollution limits, either by accepting enforceable production limits or by installing adequate pollution controls.
- 2. Require major sources of air pollution to install the best available control technology.** Many pellet mills with major source permits evade using the best available control technology, or any control technology at all, while facilities with minor source permits, often the same size or larger, do use controls. States must not reward companies for refusing to install controls that would reduce emissions to minor levels. Rather, states must require new or modified major sources to utilize controls that are at least as effective as those used by the best-controlled minor sources.
- 3. Institute pellet production limits at facilities that claim to be too minor for the best available pollution controls.** If pollution controls will not keep emissions below legal limits when a facility is operated at full capacity, the facility's permit must restrict maximum production to a level that ensures the facility will not exceed the major source threshold. Although a few permits EIP surveyed do incorporate production limits, most minor source permits do not and are therefore legally deficient.
- 4. Ensure Communities are Notified of and Able to Participate in Permitting Decisions.** Many of the air permits EIP surveyed were issued without any public notice or the ability to comment, including permits for the initial construction of facilities, in contravention of the Clean Air Act. This means communities were not informed of the decision to allow sources of air pollution to locate in their backyard. States should revise their regulations and procedures to include public notice and opportunity for meaningful input from those closest to proposed facilities.
- 5. Require annual emissions testing for volatile organic compounds and hazardous air pollutants from all of the major emission points at pellet mills.** Many permits rely on emissions estimates—frequently outdated and inaccurate—rather than source-specific emissions testing to determine the level of emissions. While continuous emissions monitoring is the best method to determine actual levels of pollution emitted, where states do not require this they must at least require annual testing of each of the major units at pellet mills for volatile organic compounds and hazardous air pollutants.
- 6. Reduce the risk of fires and explosions by requiring facilities to comply with their general duty under the Clean Air Act to design and maintain a safe facility.** Fires and explosions from wood dust plague the industry, and states should utilize a section of the Clean Air Act, called the “general duty clause,” to develop site-specific management plans that will lower the risk of dangerous fires and explosions.

Introduction

The wood pellet manufacturing industry exploded in the U.S. South beginning in the late 2000s, when the European Union began subsidizing burning wood for electricity under the false presumption that doing so would be carbon neutral. Under a loophole in the EU carbon accounting system, neither the loss of carbon-absorbing trees in U.S. South, nor the emissions from burning trees in EU are accounted for in assessing greenhouse gas emissions from wood biomass. Many climate scientists have refuted the EU's premise that cutting whole trees to burn for electricity is carbon neutral, especially in a time scale relevant to fighting the worst impacts of climate change. While the industry frequently claims to process mostly forest residuals, multiple investigations have shown this to be false.² Ecologists have also pointed out that the industry is having a major impact on forests in the South, especially ecologically valuable hardwood forests which are being cut and replanted with faster-growing softwood plantations to feed expected demand.

Although the EU has provided substantial subsidies to enable the growth of the wood pellet industry, narrow profit margins have caused European power plants to look beyond the EU for cheap sources of wood. The U.S. South, with its vast forests growing on mostly unprotected private lands, along with state and local governments eager to provide their own industry subsidies, provide the EU plants with just such a source. In the span of only a few years, the U.S. South became the world's largest wood pellet supplier. At present, EU power companies import over 4.7 million metric tons of U.S. wood pellets each year, up from just 500,000 tons in 2009 – a nearly tenfold growth over a decade.³ Projections show this growth rate continuing, and possibly accelerating if Asian nations begin importing comparable amounts of wood pellets, as many in the industry predict.⁴

As the industry has grown, so too have concerns over just how clean and sustainable it is to burn trees for electricity. Recent reports document the wood bioenergy industry's adverse impacts on southern forests as well as its role in causing global climate change.⁵ This report is the first to focus on air pollution generated by wood pellet manufacturing plants and the industry's unlawful evasion of air pollution control requirements intended to protect human health and the environment in the communities where these plants are located.

To ascertain the local and regional impacts of air pollution from wood pellet plants, EIP analyzed air permits, emissions information, and other documents related to the 21 plants exporting wood pellets, as well as 10 facilities under construction or proposed which have air permits. EIP also estimated emissions from nine proposed facilities which do not yet have air permits. This survey placed particular attention on the 15 new-generation mills built specifically to supply the international biomass demand, all of which have production rates above 300,000 tons per year, and all but one of which were built after 2010. The vast majority of pellets produced at these plants are exported to Europe, while a limited but growing portion is exported to Japan and other Asian nations.

EIP's survey reveals that these facilities emit dangerous amounts of air pollution, and further finds that state agencies consistently fall well short of their duty to ensure that these facilities control their pollution to the levels required by law, frequently due to misleading information supplied by the industry. As a result, many large pellet mills have been allowed to emit air pollution, especially volatile organic compounds (VOCs) and hazardous air

pollutants at levels well above legal limits for years at a time. When states do address these issues, they frequently fail to require actual compliance with Clean Air Act requirements. For instance, those states that have issued major new source review permits to large wood pellet plants concluded that the “best available control technology” for reducing VOCs is no controls, despite the fact that controls are in use at similar (and sometimes nearly identical) facilities. EIP’s findings are particularly concerning when viewed in conjunction with another recent report showing that wood pellet mills are substantially more likely to be located in communities living below the median income level and with large minority populations, communities frequently burdened with excess pollution from multiple industrial sources.⁶ This report provides a state-by-state analysis of the state failures and industry deceptions that riddle this emerging industry. Additionally, this report details the lengthy history of fires and explosions at pellet mills, which emit dangerous levels of air pollution.

How Pellet Mills Pollute

Before 2010, typical U.S. wood pellet mills were relatively small, producing between 10,000 and 100,000 tons of pellets per year for domestic consumption in home heating stoves. While these mills still had the potential to emit considerable amounts of air pollution, especially particulate matter, they weren’t generally large enough to trigger significant attention from permitting agencies or watchdog groups. The newer generation of mills built to feed Europe’s demand, on the other hand, are massive, producing up to 800,000 tons of wood pellets per year. While the large increase in scale came with an equally large increase in pollution, the full magnitude of emissions has not been well understood by permitting authorities. Consequently, states issued construction permits to many recent facilities under the assumption they would emit relatively low levels of air pollution (making them “minor” air pollution sources that are exempt from many control requirements), only to subsequently find that these facilities actually emit five or six times more pollution than legally allowed (making them “major” air pollution sources that should be subject to much more stringent pollution control requirements).

To understand the air pollution issues in the wood pellet industry, it is useful to understand the basics of how the facilities operate. A wood pellet manufacturing plant has two main tasks: to dry the wood to a point where it is efficient to burn in power plants, and to turn the wood into pellets for easy transport. To begin the process, wood arrives by truck (frequently whole trees from clear-cutting operations), often a half-dozen or more trucks per hour.⁷ Once at the facility, the trees are debarked and then chipped in shredding machines called hammermills. The wood is then conveyed to the dryer, usually a large rotary dryer heated by burning wood and bark, where the moisture in the wood is reduced from about 50% by weight to around 10%. After the dryer, the wood is again processed by hammermills to reduce its size to a point where it can be formed into pellets. The next unit is the pellet press, which presses the wood through holes in a die to create pellets, a process that requires large amounts of pressure and heat. The pellets are then deposited into a pellet cooler to reduce their temperature back to safe levels. A typical facility produces between 50 and 70 tons of wood pellets per hour, or between 450,000 and 650,000 tons per year. The pellets are then ready for transport to a port, where they are usually stored for some time before being shipped to Europe.

Each step in the process has the potential to emit large amounts of air pollution. The most obvious source is the drying process, as burning wood emits substantial amounts of fine particulate matter, carbon monoxide, nitrogen oxides, and greenhouse gases. While each of these pollutants has serious health or environmental impacts, fine particulate matter (PM_{2.5}) is particularly harmful to human health. PM_{2.5} consists of airborne particles less than 2.5 micrometers which can pass deep into a person's lungs and even into the bloodstream, causing heart attacks, decreased lung function, worsening asthma symptoms, and premature death. Recent research published in the *New England Journal of Medicine* found that reducing PM_{2.5} by just 1 microgram per cubic meter throughout the United States could save 12,000 lives each year.⁸ Many wood pellet mills frequently emit 60 to 80 tons per year of PM_{2.5}, even after installing controls.⁹

In addition to the particulate matter emitted from burning wood, drying wood actually emits the largest share of air pollution. Green wood (that is, wood before it has been dried), contains significant amounts of volatile organic compounds (VOCs), and applying heat or mechanical energy to the wood releases the VOCs into the air. Once in the atmosphere, VOCs combine with sunlight to produce ground-level ozone, a major constituent of smog. Breathing ozone can trigger a variety of health problems, particularly for children, the elderly, and people of all ages who have lung diseases such as asthma. In addition to the ozone risk, VOC emissions from wood pellet mills also contain numerous individual pollutants which are classified by the EPA as hazardous air pollutants, such as acetaldehyde, formaldehyde, and methanol. Hazardous air pollutants are those pollutants which EPA has identified as especially toxic or carcinogenic even in small amounts and are the most tightly regulated pollutants under the Clean Air Act.

The industry and permitting agencies have long understood that drying wood emits large amounts of VOCs and hazardous air pollutants, in large part because the drying process at pellet plants is similar to the drying process in more traditional industries like particle board manufacturing. Because of this knowledge, even the earliest of the large wood pellet plants generally utilized control technology to reduce emissions from the dryers. The most common form of control is known as a regenerative thermal oxidizer, which uses very high temperatures to destroy 95 to 99 percent of the VOCs and organic hazardous air pollutants.

What the industry and permitting agencies did not understand at the outset is that units other than the dryer also emit substantial amounts of VOCs. Until recently, many permitting authorities simply assumed the hammermills, pellet presses, and pellet coolers did not emit any VOCs at all. That assumption began to fall apart in 2012, when a large facility, Georgia Biomass in Waycross, Georgia, decided to test all of the facility's units for VOC emissions. The results showed that not only did these units emit VOCs after all, they emitted a lot of them. Georgia Biomass found that their hammermills, pellet presses, and pellet coolers emitted more than 1,000 tons per year of VOCs, whereas the facility and the state previously believed the entire facility emitted less than 250 tons per year. This meant the facility had been operating in violation of its permit limits and the Clean Air Act's major source requirements for several years, leading Georgia to levy heavy fines and issue a consent order requiring the facility to reduce its facility-wide VOC emissions to below 250 tons per year.

Testing at a Florida facility in 2013 and an Alabama facility in 2014 soon confirmed Georgia's findings. Both tests showed that the facilities had likewise been emitting VOCs well beyond legal limits. Unfortunately, though by 2014 three sets of testing showed that large pellet mills emitted substantially more VOCs than most permits allowed, most states have yet to take meaningful action to address the problem.

Clean Air Act Permitting 101

In order to understand the systematic issues identified by EIP, this section provides a brief primer on the basic framework of Clean Air Act permitting and how it applies to the wood pellet industry (Appendix A contains a lengthier explanation). The basic scheme of Clean Air Act permitting is that facilities which either actually emit or have the potential to emit various pollutants above certain thresholds must apply for corresponding permits before beginning construction and/or operating, which contain certain requirements such as using pollution controls or limiting emissions. The key permits at issue in the wood pellet industry are "major source" permits and hazardous air pollutant permits. Major source permitting is a rigorous set of requirements meant to reduce emissions from the largest sources of air pollutants. For the wood pellet industry, facilities must go through major source permitting and install the best available control technology if they have the *potential* to emit more than 250 tons per year of any pollutant. Permitting for hazardous air pollutants, meanwhile, requires the use of the maximum achievable control technology, an even more stringent standard, for facilities which emit or have the potential to emit more than 10 tons per year of any hazardous pollutant, or more than 25 tons per year of all hazardous air pollutants. Note that both permitting requirements are triggered not only by actual emissions, but by potential emissions (which are usually the level of emissions when a facility operates at full capacity). Finally, one key thing to recognize is that these permitting programs are primarily administered by state environmental agencies, and while the federal EPA has some oversight, the vast majority of decision-making and enforcement occurs at the state level. This means permits and enforcement vary considerably from state to state.

Part One: State-by-State Analysis of Permits Reveals a Troubling Pattern

After the initial revelations that wood pellet mills emit substantially more VOCs than initially believed, states reacted in many different ways. A few states took the violations seriously and required some facilities to install controls and/or reduce their pollution levels. This includes Georgia, where the VOC discovery was first made, and Alabama, which required the installation of a second pollution control system at a facility after it discovered the violation. Most other states failed to address the problem in an adequate manner. This section details those issues and other permitting deficiencies which have allowed the industry to pollute above legal limits for years.

North Carolina

North Carolina is home to three wood pellet manufacturing plants owned by a company called Enviva Biomass in Sampson, Northampton, and Hertford Counties, and a fourth

Enviva facility is under construction in Richmond County. The state has been the most egregious in terms of allowing unnecessary and unlawful pollution from the industry. While most wood pellet plants utilize at least some VOC and hazardous air pollutant controls, North Carolina illegally allows all three Enviva plants to operate without any VOC or hazardous air pollutant controls whatsoever and will do the same for the fourth when it begins operations. In fact, out of all of the large pellet mills in the country, only one other facility operates without VOC or hazardous air pollutant controls of any kind: the Enviva Southampton plant just across the border in southern Virginia, near Chesapeake. Due to North Carolina’s lax oversight and Enviva’s reluctance to install controls, the Enviva plants are the largest emitters of VOCs and hazardous air pollutants in the industry, emitting five to six times the level of VOCs and 50 times the level of hazardous air pollutants as comparable facilities.

Table A. Annual Air Pollution from Exporting Pellet Mills in North Carolina

	Annual Particulate Pollution	Annual CO Pollution	Annual Nitrogen Oxide Pollution	Annual VOC Pollution	Annual Total Pollution	Annual CO ₂ Emissions
Existing Plants (3)	366 tons	337 tons	529 tons	1,396 tons	2,628 tons	552,655 tons
Existing (3) and Under-Construction (1)	511 tons	568 tons	749 tons	2,024 tons	3,852 tons	782,483 tons

Many North Carolina Plants Avoid Installing Best Available Control Technology

Typically, industrial facilities seek to avoid the most stringent Clean Air Act control requirements by voluntarily limiting their air pollution levels that qualify them as “synthetic minor” sources (synthetic in the sense that they could be major sources but have limited themselves to minor source levels of emissions). Ironically, the current situation in the wood pellet manufacturing industry is that the “synthetic minor” air pollution sources usually utilize VOC controls while the “major” sources that are subject to more stringent control requirements do virtually nothing to control VOC pollution. Enviva’s existing Sampson plant, located 35 miles east of Fayetteville, NC, and Enviva’s proposed Hamlet plant (40 miles west of Fayetteville) are prime examples of this phenomenon. Enviva conceded at the outset that both plants qualified as “major” sources due to their VOC emissions.¹⁰ Accordingly, major source permitting requirements applied to both plants, including the requirement to control air pollution to the level that can be achieved using “best available control technology.” The decision of what constitutes the best available control technology for controlling VOC emissions should be straightforward: what is the best type of pollution control technology utilized at similar facilities? As discussed above, every other non-Enviva facility of similar size operates with a regenerative thermal oxidizer controlling the facility’s dryer. Many also reduce VOC emissions from other units by using additional pollution controls. These controls can reduce VOC and hazardous air pollutant emissions by 95% or more.¹¹ Accordingly, North Carolina plainly should have selected these same controls as “best available control technology” for the Enviva Hamlet and Enviva Sampson plants. It did not. Rather, North Carolina concluded that Enviva need not install any VOC controls whatsoever. The problem is clear when Enviva’s plants are compared to similar facilities. For example, an older facility in Georgia, Georgia Biomass, actually produces more wood

pellets than Enviva Sampson, yet the Georgia plant emits just 130 tons of VOC per year compared to Enviva Sampson's 628 tons per year. This is because Georgia Biomass utilizes VOC control technology, despite being a synthetic minor source, while Enviva Sampson, a major source that should use the best available control technology, uses no controls at all.

Neither Enviva nor North Carolina indicated it was infeasible to install the VOC controls—regenerative thermal oxidizers—on the Sampson and Hamlet plants.¹² Rather, Enviva argued that a regenerative thermal oxidizer would be cost prohibitive, despite the fact that every other comparable company in the industry is able to afford the technology at least for the wood drying operations.¹³ Enviva further argued that adequate VOC reductions could be achieved at both facilities by restricting the wood processed to 25% hardwood and 75% softwood, rather than 100% softwood. This is because softwood emits more VOCs than hardwood.¹⁴ While this reduction in softwood does result in a small reduction of VOCs, perhaps 20%, it pales in comparison to the reduction achievable by the use of regenerative thermal oxidizers, which reduce VOC and organic hazardous air pollutant emissions by at least 95%.¹⁵ With the use of regenerative thermal oxidizers, Enviva would lower VOC emissions from 628 tons per year to less than 50 tons per year.

In addition to not being an effective control technology to reduce VOC and hazardous air pollutant emissions, processing hardwood presents other significant environmental impacts. The use of slow-growing hardwood forests as feedstock, forests which sequester more carbon than softwood pine forests, results in more carbon in the atmosphere, even decades after the wood pellets have been burned.¹⁶ The harvesting of bottomland hardwood forests is also concerning because of the critical ecosystem services that will be lost if these wetland habitats are decimated. Wetland forests buffer communities from storms and floods, and remove nutrients and other pollutants from water to maintain the quality of streams, rivers, and estuaries.¹⁷ Destruction of hardwood forests also depletes habitats of endangered and imperiled species.¹⁸

Violations of Air Pollution Regulations at Plants in Richmond and Sampson Counties Means Massive Emissions of Hazardous Air Pollutants.

In addition to allowing dangerously high VOCs, North Carolina's failure to require Enviva to install control devices at Enviva Hamlet and Enviva Sampson also means these facilities emit hazardous air pollutants at more than twice the legal threshold. In fact, emissions testing at Enviva Sampson recently revealed the facility's dryer emits up to 50 times more hazardous air pollution than comparable facilities, simply because North Carolina has not required pollution controls at the facility, and Enviva has refused to install the controls voluntarily.

Manufacturing wood pellets emits significant levels of hazardous air pollutants, especially acetaldehyde, formaldehyde, and methanol. EPA lists acetaldehyde and formaldehyde as probable human carcinogens, and both cause additional short term respiratory problems and chronic symptoms occur from long term exposure.¹⁹ The health risks of methanol emissions, meanwhile, include "a decrease in gestation time, an increase in the number of required Caesarian-section births, and, in prenatally exposed children, instances of a severe wasting syndrome, concentration-related delay in sensorimotor development and lower performance on an infant intelligence test."²⁰

The Clean Air Act requires that major sources of hazardous air pollutants like Enviva Hamlet and Enviva Sampson utilize the maximum achievable control technology, which is meant to be even more stringent than the “best available control technology” standard for other pollutants. Unfortunately, North Carolina has not required any control technology at all to reduce hazardous air pollutants at Enviva Sampson and Enviva Hamlet. This is extremely problematic, as control technology which can massively reduce these hazardous air pollutant emissions is standard in the wood pellet industry.²¹ The hazardous air pollutants emitted at wood pellet facilities are largely emitted from the burning and drying of wood, and because these hazardous air pollutants are also VOCs, control technologies that reduce VOCs also reduce these particular hazardous air pollutant emissions.²² This means installing a regenerative thermal oxidizer on the dryers at Enviva Sampson and Enviva Hamlet would reduce hazardous air pollutant emissions by 95% or more. Every other non-Enviva facility that EIP surveyed has installed a regenerative thermal oxidizer on their dryer, vastly lowering their hazardous air pollutant emissions.

Without this technology, the Enviva plants emit 300 times more formaldehyde and 71 times more acetaldehyde than Hazlehurst Wood Pellets, a Georgia facility with a similar process rate but that uses a regenerative thermal oxidizer. The Enviva facilities’ hazardous air pollutant emissions are substantially higher even than Georgia Biomass, the largest pellet mill in the country, because Georgia Biomass has installed regenerative thermal oxidizers while the Enviva plants have not. Although testing for hazardous air pollutant emissions is unfortunately rather rare, Table B below compares the available testing at similar facilities to the Enviva Sampson and Enviva Hamlet plants.

Table B. Enviva Sampson and Enviva Hamlet Emit Much More Hazardous Air Pollutants Than Comparable Facilities That Utilize Regenerative Thermal Oxidizers.

Facility	State	Production Rate (tons per year)	Acetaldehyde Emissions (tons per year)	Formaldehyde Emissions (tons per year)	Methanol Emissions (tons per year)	Total HAP Emissions (tons per year)
Georgia Biomass	GA	826,000	1.7	7.6	5.0	15.4
Drax Amite	MS	578,000	No Data	0.4	No Data	No Data
Hazlehurst	GA	525,000	0.16	0.08	0.87	1.1
Enviva Sampson/Enviva Hamlet ^A (Initial Test)	NC	535,000	19.9	23.7	13.4	70.1
Enviva Sampson/Enviva Hamlet ^A (Second Test) ^B	NC	535,000	11.4	24.4	8.14	55.5

A. Although Enviva Hamlet is not yet operating, it is very similar to the Sampson facility.

B. After the first round of testing showed the facility was exceeding its VOC limits, Enviva tweaked their dryer, which somewhat reduced VOC emissions and some HAP emissions. It is unclear whether Enviva will continue to operate in this manner, but even if they do, emissions are still much higher than other facilities.

If Enviva Sampson and Enviva Hamlet installed regenerative thermal oxidizers on their dryers, hazardous air pollutant emissions would be cut by at least 95%.²³ Total hazardous air pollutants would be reduced from 55.5 tons per year to just 2.7 tons per year, and formaldehyde emissions would be lowered from around 24 tons per year to 1.2 tons. Acetaldehyde and methanol would both be reduced to less than one ton per year.

Enviva's Illegal Scheme to Avoid Major Source Permitting in Northampton County

North Carolina impermissibly removed limits intended to reduce VOCs from Enviva's mill in Northampton County, allowing the facility to emit 200 tons more VOCs than similar facilities. Like the other Enviva facilities, Enviva Northampton's VOC emissions are uncontrolled, despite the fact that it emits well over the 250 ton per year major source threshold that should require the use of the best available control technology. Initially, North Carolina allowed Enviva to construct without VOC controls based on Enviva's agreement to accept enforceable limits designed to ensure that the facility's emissions qualified as "minor" (and therefore exempt from control requirements).²⁴ Specifically, Enviva agreed to reduce VOC emissions by processing no more than 10% softwood and to not dry the wood to lower than 13% moisture content.²⁵ But only two years later, Enviva apparently decided those restrictions no longer fit within its business plan and asked North Carolina to remove them from the Northampton facility's air permit.²⁶ North Carolina obliged, but still did not require Enviva to comply with the permitting and pollution control requirements applicable to major air pollution sources.²⁷ The law is clear that North Carolina acted illegally: when a facility takes a limit to avoid stringent Clean Air Act requirements applicable to "major" sources, as Enviva Northampton did, any subsequent relaxation of that limit that allows the source to emit more than the major source threshold (here, 250 tons per year of VOCs) triggers the requirement to obtain a major source construction permit and install required pollution controls.²⁸ North Carolina disregarded that requirement and allowed Enviva to continue operating the Northampton plant without VOC controls. The facility now emits 377 tons per year of VOCs, and is authorized to emit up to 456 tons per year—despite being constructed as a "minor" air pollution source.²⁹

Table C on the following page shows that Enviva Northampton is the largest wood pellet mill in the country that does not utilize VOC control technology. To further illustrate the high emissions, other facilities which process various rates of softwood are adjusted to operating at 30% softwood, the same rate the Enviva Northampton currently processes. Once this adjustment is made, it is clear that Enviva Northampton's VOC emissions are substantially higher than they could be if Enviva utilized a regenerative thermal oxidizer on their dryer. Further, had the facility gone through legitimate major source permitting, VOC emissions from the hammermills and pellet coolers would also be reduced because major source permitting's best available control technology requirement applies to each emission unit with significant emissions.

Table C. VOC Controls on Dryers at Pellet Mills Above 300,000 Tons Per Year Production Rate; Enviva Northampton Highlighted

Facility	State	Production Rate	VOC Controls On Dryer	Softwood Content	Actual VOC Emissions (tons per year)	VOC Emissions at 30% Softwood ^A (tons per year)
Georgia Biomass	GA	826,000	Yes (RTO and RCO)	100%	120	36
Enviva Cottondale	FL	821,000	Yes (RTO)	100%	517	155
Zilkha Monticello ^B	AR	661,000	Yes (RTO)	100%	249	74
Enviva Northampton	NC	628,000	No	30%	377	377
Drax Amite	MS	578,000	Yes (RTO)	100%	249 ^C	63
German Pellets	TX	578,000	Yes (RTO)	100%	580	174
Enviva Southampton	VA	535,000	No	10%	245	321
Enviva Sampson	NC	535,000	No	75%	628	251
Enviva Hamlet ^B	NC	535,000	No	75%	628	251
Colombo (Now Enviva Greenwood)	SC	175,000 ^D	Yes (RTO)	100%	249 ^D	74
Hazlehurst	GA	525,600	Yes (Sent to burner, 90% reduction)	100%	216	64
Highland Pellets	AR	500,000	Yes (Sent to burner, 90% reduction)	100%	245	73
Drax Morehouse	LA	500,000	Yes (RTO)	98%	249 ^E	76
Drax LaSalle	LA	500,000	Yes (RTO)	100%	611	183
Enviva Ahoskie	NC	420,000	No	30%	280	280
Westervelt	AL	320,000	Yes (Two RTOs)	100%	28	8
Zilkha	AL	300,000	Yes (RTO)	50-100%	246	73

A. Facilities utilize a range of softwood content, however, for comparison purposes, we assume in this column that all facilities are utilizing 30% softwood, which is what the Enviva Northampton plant currently utilizes.

B. Facility is permitted but not yet operating.

C. This facility's permit limit is 249 tons per year, but research by EIP shows it likely emits much higher levels, up 1,000 tons per year; see the section on Mississippi below.

D. Colombo Energy has the capacity to produce 669,000 tons per year, but without VOC controls on its post-dryer emissions, the facility must limit operations to avoid exceeding the 250 ton per year major source threshold. See the discussion on this facility below in the South Carolina section.

E. This facility's permit limit is 249 tons per year, but research by EIP shows it likely emits much higher levels, potentially more than 700 tons per year, see the section on Louisiana below.

Complete Lack of Public Input at Enviva’s Northampton and Hamlet Plants When It Mattered.

The most troubling aspect of Enviva Northampton’s permitting history is that it was completely opaque; the public never had notice or the opportunity to comment on the facility’s construction or subsequent modification to emit more than 250 tons per year of VOCs.³⁰ This is because North Carolina’s regulations do not require public notice or comment for minor source permits such as the one obtained by Enviva for Northampton, likely in contravention of the Clean Air Act.³¹ This is in contrast to the major source permit process, for which North Carolina does require public notice and comment. In other words, residents who live near the Northampton facility—now emitting at major source levels—never knew about the levels of pollution emitted, or the decision to allow the facility to increase its emission above the major source threshold. Had the facility initially proposed to emit 377 tons per year of VOCs, the permits would have been subject to public notice and comment, but Enviva craftily avoided these requirements by taking initial limits and then eliminating those limits just two years later.

The public also lacked an adequate opportunity to provide input for the permit for Enviva Hamlet in Richmond County. As noted above, this permit allows the highest level of air pollution in the industry. In issuing this permit, the state failed to follow clear regulations which serve to inform the public about the proposed facility near the predominantly African American community of Dobbins Heights. North Carolina never held a public hearing on the permit, notwithstanding the Clean Air Act’s clear mandate to do so and despite requests by the community.³² North Carolina also issued public notice and draft permits for the facility with incorrect addresses, making it difficult for citizens to learn whether the facility would be built in their backyard or elsewhere.³³ While North Carolina dismisses these issues as minor typos, the failure to give the proper address meant that those who were most impacted could not reasonably discover the true location of the plant until after the opportunity to file comments or request a hearing.

Texas

Texas only has one exporting pellet plant, German Pellets northeast of Houston, but the facility has had a serious history of failing to comply with the Clean Air Act, as well as the worst record of fires in the industry, with at least five fires or explosions since 2014. One fire at a German Pellet’s storage facility in Port Arthur burned for more than 50 days, sickening residents and leading to multiple lawsuits.

Table D. Annual Air Pollution from Exporting Pellet Mills in Texas

	Annual Particulate Pollution	Annual CO Pollution	Annual Nitrogen Oxide Pollution	Annual VOC Pollution	Annual Total Pollution	Annual CO ₂ Pollution
Existing plants (1)	72 tons	98 tons	175 tons	580 tons	925 tons	190,923 tons

Pellet Plant in Woodville Has Violated Clean Air Law for Years, but Texas Proposes no New Controls

The German Pellets facility in the community of Woodville, Texas, 90 miles northeast of Houston, has emitted VOCs at nearly double its permitted limits and the major source threshold since it began operation in 2013, with VOC emissions approaching 600 tons per year. Despite the testing at multiple facilities dating to 2012 that proved large facilities like German Pellets could not remain below the major source threshold without additional controls, German Pellets apparently did not discover that it was itself violating its permit limit of 64 ton per year (as well as the 250 ton per year major source threshold) until late 2014. It turns out the facility actually emits 580 tons of VOCs per year.³⁴ Instead of punishing the facility for violating the terms of its permit and exceeding the Clean Air Act's major source threshold for nearly five years, Texas has allowed the facility to continue to operate at full capacity, emitting the same level of illegal VOC emissions. In fact, Texas is now proposing to issue a major source permit to the facility that simply raises the emissions limits to levels with which German Pellets can comply while requiring no additional VOC control measures.

While German Pellets does utilize a regenerative thermal oxidizer on its dryer, the hammermills and pelletizing lines are uncontrolled and emit substantial amounts of VOCs. The two pellet coolers emit 446 tons per year of VOCs, and the total post-dryer emissions are 514 tons per year. As discussed above, the major source permitting process must limit emissions to the level that can be achieved by using best available control technology. A regenerative thermal oxidizer or a regenerative catalytic oxidizer—controls which have been installed on hammermills and pelletizing units at several other facilities—should have been chosen as the best available control technology.

German Pellets submitted misleading information to the Texas permitting authority to justify not installing control technology. In particular, German Pellets dismissed from consideration all facilities which utilize control technology for the hammermills and pellet coolers on the grounds they were permitted as minor sources, and only submitted information on facilities that do not use controls.³⁵ German Pellets further stated that it was “consistent with other similar operations” not to install VOC controls on the post dryer units.³⁶ The fact of the matter is that many wood pellet mills do utilize these controls, as Table E below shows. The Clean Air Act's best available control technology mandate therefore requires the same level of controls at German Pellets, regardless of the type of permit in place at similar facilities (in fact a proper analysis must even evaluate international facilities if they achieve greater emission reductions).³⁷ Yet based on German Pellets' application, Texas authorities may not have even been aware that such controls were in use in the industry because the facility only submitted information on plants that do not use controls on their post-dryer units.

A regenerative thermal oxidizer, in use at several other facilities, would reduce the total post-dryer emissions from 514 tons per year to just 25 tons per year. Another alternative, in use at several facilities, is to route the post-dryer emissions to the dryer and its regenerative thermal oxidizer, a technique that achieves at least 95% VOC reduction. These are not extreme options; as Table E below shows, most similar facilities (i.e. facilities processing mostly softwood) utilize some form of technological control to reduce VOCs. Yet Texas is

proposing a permit which would not require any technological controls on the relevant units, despite the best available technology requirement.

Table E. Despite German Pellets' Claim, Many Facilities Utilize Controls to Reduce Post-Dryer VOC Emissions

Post-Dryer Controls at Synthetic Minor Pellet Mills Processing More than 50% Softwood							
Facility Name	State	Production Rate	Softwood Content	Major Source	VOC Controls on Hammermills	VOC Controls on Pellet Presses and/or Coolers	Facility-wide VOC Emissions
Georgia Biomass	GA	826,000	100%	No	RTO (95% control)	RTO (95% control)	130
Enviva Cottondale	FL	821,000	100%	No	Sent to Burner-RTO (95% control)	Sent to Burner-RTO (95% control)	517
Zilkha Monticello (proposed and permitted)	AR	661,912	100%	No	Sent to Burner-RTO (95% control)	Sent to Burner-RTO (95% control)	249
Drax Amite	MS	578,000	100%	No	None	None	900 ^A
Colombo Energy (Now Enviva Greenwood)	SC	168,000 ^B	100%	No	Limited Operating Hours	Limited Operating Hours	249
Hazlehurst	GA	525,600	100%	No	Sent to Burner-RTO (95% control)	Sent to Burner-RTO (95% control)	216
Highland Pellets	AR	500,000	100%	No	Sent to Burner (90% control)	Sent to burner (90% control)	208
Highland Pellets South (proposed)	AR	500,000	100%	No	Sent to Burner (90% control)	Sent to burner (90% control)	208
Drax Morehouse	LA	500,000	100%	No	None	None	465 ^C
Bord na Mona (proposed and permitted)	GA	330,000	50-100%	No	Sent to Burner-RTO (95% control)	None	192
Westervelt	AL	320,000	100%	No	RTO (95% Control)	RTO (95% Control)	139
Post-Dryer Controls at PSD Major Source Pellet Mills							
German Pellets	TX	578,000	100%	Yes	None	None	580
Enviva Sampson	NC	535,000	75%	Yes	None	None	628
Enviva Hamlet (Proposed and permitted)	NC	535,000	75%	Yes	None	None	628
Drax LaSalle	LA	500,000	100%	Yes	None	None	611

A. This facility has never tested its post-dryer units; emissions based on Georgia Biomass emission factors. See the Mississippi section below.

B. Facility has the capacity to operate at up to 669,000 tons per year but is limiting operating hours to avoid exceeding permit limits.

C. This facility has never tested its pellet coolers. Pellet cooler emissions estimated based on average emission factor for pellet coolers derived from stack testing (see Louisiana section below). Actual emissions could be as high as 745 tons per year.

Mississippi

Mississippi is home to three pellet mills exporting to Europe: two relatively small Enviva plants, Enviva Amory ear Tupelo and Enviva Wiggins near Gulfport (Enviva is in the process of selling the Wiggins plant), and one large facility in Amite County owned by Drax Biomass. Drax also owns and operates the Drax power plant in the UK, which is the largest consumer of wood pellets in the world, and the single largest emitter of CO₂ in the UK. The Drax power plant is almost exclusively supplied by pellet plants in the U.S. South, including Drax’s own mills, Enviva’s mills, and others. In addition to the existing mills, a fourth facility is proposed in the state, Enviva Lucedale, north of Biloxi.

Table F. Annual Air Pollution from Exporting Pellet Mills in Mississippi

	Annual Particulate Pollution	Annual CO Pollution	Annual Nitrogen Oxide Pollution	Annual VOC Pollution	Annual Total Pollution	Annual CO ₂ Pollution
Existing Plants (3)	462 tons	309 tons	325 tons	1,400 tons	2,496 tons	270,617 tons
Existing (3) and proposed (1) plants	607 tons	540 tons	545 tons	2,028 tons	3,720 tons	500,445 tons

Note: Particulate, CO, and Nitrogen Oxide emissions from Enviva Wiggins and Amory estimated based on similar facilities as this data was not available. Emissions from the proposed Enviva Lucedale are the same as Enviva Sampson, Enviva’s most recently-constructed plant.

Drax Plant in Gloster Misleads Mississippi on VOC Emissions

Drax Biomass appeared to mislead Mississippi officials in order to avoid major source permitting requirements at its Drax Amite facility in Gloster. Drax submitted extremely low emissions estimates for certain units based on testing that Drax should have known was invalid. By doing so, Drax was able to convince Mississippi that the Amite facility’s VOC emissions were below the 250 ton per year major source threshold, when more reliable testing data showed the facility’s emissions were likely to be around 1,000 tons per year. Troublingly, Mississippi has never required that the facility conduct emissions testing on the relevant units, and instead has accepted Drax’s estimates.

As with other large facilities initially permitted before 2013, Drax initially assumed that only Amite’s dryer would emit VOCs. It took until 2016 for Drax to acknowledge that other units emit any VOCs at all.³⁸ Drax then asserted that these emissions were minor, and that emissions from these units would be just “0.704 lb/ton [pounds of VOCs per ton of wood pellet produced], based on testing performed at Green Circle Bio Energy with 10% additional margin included.”³⁹ Drax did not provide the cited test data with its application, and supplied no further information on the test. It turns out that Drax was referring to 2010 tests performed at Green Circle Bio Energy in Florida.⁴⁰ Subsequent testing performed at that facility in 2013 showed that the 2010 tests were completely invalid, and that the Green Circle facility actually emitted more than 1,000 tons of VOCs per year.⁴¹ The true emissions rate at Green Circle (now Enviva Cottondale) for all post-dryer units was 3.25 lb/ton, almost five times higher than the .704 lb/ton proposed by Drax.⁴² Further, the 3.25 lb/ton rate is completely consistent with other wood pellet plant manufacturing plant tests such as

the Georgia Biomass testing (showing 3 lb/ton).⁴³ This means Drax Amite's true facility-wide emissions are likely above 900 tons per year, vastly exceeding the major source threshold of 250 tons per year.

While it is hard to prove that Drax intentionally misled Mississippi, it is difficult to fathom that Drax, one of the most prominent companies in the industry, was not aware of the elevated VOC issue when it submitted its Title V permit application in August 2016, or likewise was unaware that Green Circle had conducted subsequent testing in 2013 disproving the 2010 tests. Regardless, it may have worked: Mississippi proposed to issue the operating permit without questioning the assumed .706 lb/ton emission rate Drax provided. Mississippi states that testing at Drax Amite showed a "large margin of compliance" with the 249 ton per year VOC limit.⁴⁴ The problem is that these tests only tested the facility's dryer and not the other significant sources of VOCs like hammermills and pellet coolers. In other words, Mississippi is still apparently operating under the impression that post-dryer units do not emit any VOCs, a completely incorrect assumption given the numerous tests conducted in the industry since 2013.

Mississippi's proposed permit continues to treat Drax Amite as a minor source, despite likely VOC emissions of nearly 1,000 tons per year, four times higher than the 250 ton-per-year major source threshold. Further, Mississippi did not even propose to require Drax to test the Amite facility's post-dryer units, so Drax can continue avoiding major source control requirements with impunity. EIP and a coalition of other concerned public interest groups recently filed comments with Mississippi during the public comment period on the draft permit that raised the above concerns regarding VOC emissions. Mississippi is currently reviewing the comments.

Mississippi Allows Unlawful Hazardous Air Pollutant Emissions from Enviva Mills in Stone and Monroe Counties

Enviva Wiggins in Stone County, north of Gulfport, and Enviva Amory in Monroe County southeast of Tupelo, are two relatively small pellet mills which Enviva purchased in 2010. Despite being smaller than Enviva's newer mills, both facilities have troublingly high hazardous air pollutant emissions because, as with the other Enviva mills, Enviva does not utilize any hazardous air pollutant controls, in contravention of the Clean Air Act. As explained below, potential hazardous air pollutant emissions from each of these facilities easily exceeds the level that triggers major source maximum achievable control technology requirements under the Clean Air Act, yet both sources claim to be minor sources that are exempt from these requirements. A compounding problem is that Mississippi issued utterly deficient permits to the two facilities authorizing wood pellet production rates that clearly lead to hazardous air pollutant emissions in excess of the major source threshold.

At Enviva Wiggins, emissions testing revealed that the facility, when operating at the permitted production rate of 185,550 tons per year, emitted 31 tons per year of hazardous air pollutants, including 10.3 tons of methanol.⁴⁵ The rates meant the facility was exceeding the threshold that triggers maximum achievable control technology for hazardous air pollutant emissions. Rather than install these controls, the facility decided to lower its emissions by restricting production. Based on the testing, Enviva's own consultant calculated that the facility would need to limit production to 140,000 tons per year to

remain below the hazardous air pollutant limit, yet Mississippi inexplicably authorized wood pellet production of up to 165,000 tons per year, which only reduced total hazardous air pollutant emissions to 28 tons per year.⁴⁶ This means the facility is still a major source of hazardous air pollutants, but is not complying with the major source requirement to install maximum achievable control technology. Notably, if the facility installed a regenerative thermal oxidizer, total emissions would be less than two tons per year.

The hazardous air pollutant situation at Enviva Amory is also troublesome. Emissions testing there purportedly showed that the facility's hazardous air pollutant emissions were either zero or essentially zero, which is simply not plausible given that it has no hazardous air pollutant controls and operates at similar rates to Enviva Wiggins.⁴⁷ The testing found no acetaldehyde at all and just .64 tons per year of formaldehyde. These rates are highly inconsistent with stack tests at similar facilities, which generally show that wood drying emits considerable amounts of formaldehyde and acetaldehyde.⁴⁸ Although Mississippi apparently accepted Enviva's Amory test results, North Carolina rejected them when Enviva offered them as justification for not installing hazardous air pollutant control devices at its North Carolina facilities.⁴⁹ North Carolina's Stationary Source Compliance Branch found that the consultant that performed the testing for both Enviva facilities had used incorrect values for several significant pollutants, including acetaldehyde and formaldehyde, meaning the testing for both facilities underrepresented the facilities' hazardous air pollutant emissions.⁵⁰

Enviva Facility Near Tupelo is Violating Major Source Permitting Requirements and Avoiding the Use of Pollution Controls

Enviva Amory, the Enviva facility southeast of Tupelo, also has major issues with its VOC emissions, with several past and continuing violations. Most concerning is that the facility is currently operating in violation of the Clean Air Act's major source requirements. Facilities that have the potential to emit 250 tons per year or more of pollutants like VOCs must go through major source permitting (which requires the use of the best available control technology) or take legally enforceable limits to ensure that actual emissions stay below the major source applicability threshold. As shown below, Enviva Amory has the potential to emit VOCs well above 250 tons per year but has neither obtained a major source permit nor agreed to an enforceable emissions limit that would enable it to avoid major source permitting. Further, the facility is operating without any VOC controls whatsoever, meaning it is not complying with major source permitting's best available control technology requirement.

When initially constructed, Enviva claimed that the Amory facility's VOC emissions would not only be below the 250 ton-per-year major source applicability threshold, but also below the 100 ton-per-year required to apply for a federal operating permit known as a Title V permit.⁵¹ Accordingly, Enviva accepted a VOC emissions limit of 99 tons per year and a production limit of 99,000 tons of wood pellets per year to keep its actual emissions below the Title V threshold.⁵² Subsequent emission testing at Enviva Amory in 2013 showed that VOC emissions were 185 tons per year when producing 99,000 tons per year of pellets, far exceeding its 99 tons-per-year permit limit and the Title V threshold.⁵³ In light of the test results, Enviva applied for a Title V operating permit, but when Mississippi issued the new permit, it altogether eliminated the limits on the facility's VOC emissions and production

rate.⁵⁴ The new permit also does not limit the kind of wood the facility can process.⁵⁵ This is highly problematic, because the facility could easily emit more VOCs than the major source threshold of 250 tons even without increasing capacity beyond its current rate. Because softwood emits much higher levels of VOCs than hardwood, any increase in the softwood processed in the mix increases VOCs. Troublingly, the testing did not report what ratio the facility processed during the testing. This is basic information that is almost always included in testing reports. For instance, the Enviva Wiggins test states that it was conducted at 60% softwood.⁵⁶ If the testing at Amory occurred when the facility was processing relatively low levels of softwood, which is likely based on the results compared to similar facilities, then the resulting rate of 185 tons per year would not be representative of what the facility is capable of emitting. Since the permit contains no limit on the amount of softwood processed, Enviva Amory can process whatever it wants, including 100% softwood like many other wood pellet plants. At 100% softwood, the facility would emit 562 tons per year of VOCs at the current production rate.⁵⁷ This means the facility is currently violating major source rules, which require compliance with major source permitting and best available control requirements based on a facility’s *potential* to emit pollution. Enviva Wiggins clearly has the potential to emit above 250 tons per year of VOCs and its permit has zero limits preventing it from doing so.

To illustrate how easy it would be for the facility to have emissions above the 250 ton per year major source threshold—assuming that during testing the facility was processing the same rate of softwood as Enviva Wiggins, 60% softwood—then an increase to just 65% softwood would place the facility’s actual emissions beyond 250 tons per year (this is in part because Enviva Amory’s testing occurred at a production rate of 99,000 tons per year, but now operates at 121,000 tons per year).⁵⁸

Louisiana

Louisiana hosts two large pellet mills; both are currently owned by Drax Biomass. The Drax Morehouse facility is located about 30 miles north of Monroe, Louisiana, while Drax Lasalle is located 35 miles north of Alexandria.

Table G. Annual Air Pollution from Exporting Pellet Mills in Louisiana

	Annual Particulate Pollution	Annual CO Pollution	Annual Nitrogen Oxide Pollution	Annual VOC Pollution	Annual Total Pollution	Annual CO ₂ Pollution
Existing Plants (2)	223 tons	271 tons	590 tons	911 tons	1,995 tons	367,810 tons

Drax Plant North of Monroe, Louisiana Likely Exceeds Major Source Limits, Yet Louisiana has Never Required Testing

Drax’s plant in Morehouse County does not control VOC emissions from its post-dryer units, and likely emits well above the 250 ton per year major source threshold. Unfortunately, although Louisiana did require VOC emissions testing from the facility’s dryers and hammermills, for reasons that are not clear the state did not require emissions

testing on Drax Morehouse’s pellet coolers. Pellet coolers can be massive sources of VOC emissions, with testing at several similar facilities finding VOC emissions above 400 tons per year.⁵⁹ Drax, however, claims the Morehouse facility’s pellet coolers emit just 20 tons per year of VOCs based on their own in-house testing.⁶⁰ Such in-house testing is not subject to the rigorous regulations and review procedures meant to ensure testing is an accurate reflection of true emissions. For instance, unlike legitimate testing, Drax did not need to comply with any EPA-approved methodology, did not need to submit data and records from the test for review, did not need to test at full capacity (in fact the testing occurred at 35% capacity, which is well below the 80% or 90% minimum required by most states), nor did Drax need to notify the state that they were conducting the testing in order to allow state oversight. Nonetheless, Louisiana accepted Drax’s proposed emissions rate without even reviewing Drax’s testing protocols or the actual test results.⁶¹

Without adequate testing, it is hard to believe that Drax’s self-reported emission rate, which is 20 to 25 times lower than similar facilities, is trustworthy. Table H below shows how Drax’s emission factor compares to similar facilities:

Table H. Drax Morehouse’s Self-Reported Emission Factor is an Extreme Outlier.

Facility	State	Facility Production Rate at the Time of Testing (tons per year)	Uncontrolled Pellet Cooler VOC Emissions (tons per year)	Uncontrolled Pellet Cooler VOC Emission Factor (lb/ton)	Comparison to Drax Morehouse’s Self-Reported Emission factor of .065 lb/ton
Drax Morehouse “engineering testing data”	LA	578,000	20	.065	-
Enviva Amory	MS	99,000	101	1.6	25 times higher
German Pellets	TX	578,000	446	1.54	23 times higher
Enviva Cottondale	FL	610,000	460	1.5	23 times higher
Georgia Biomass (with steam injection)	GA	820,000	533	1.3	20 times higher
Hazlehurst Wood Pellets	GA	525,000	166	.62	9.5 times higher
			Average Emission Factor:	1.09	16 times higher

Sources: Stack testing reports from plants other than Drax; Drax’s emission factor from permit applications.

The issue of Drax Morehouse’s pellet cooler emissions is not trivial. At the emission factors Louisiana accepted from Drax, Louisiana states that the facility is currently emitting 249.21 tons per year.⁶² This means even a minute error in the pellet cooler emission rate would push the facility above the 250 ton per year major source threshold. In fact, applying any of the above test-derived emission rates to Drax Morehouse’s pellet cooler results in a facility-wide VOC emission rate of at least 300 tons per year, and could be as high as 691 tons per year. Applying the average mission factor from the table above places the facility’s total VOC emissions at 544 tons per year.

Notably, if Drax Morehouse installed a regenerative thermal oxidizer or other VOC control technology to its post dryer units, whether to remain below the major source threshold or to

comply with major source permitting’s best available control technology mandate, Drax could reduce VOC emissions to less than 50 tons per year.⁶³

Virginia

One pellet plant, owned by Enviva, is currently operating in Virginia, and Enviva has proposed a second facility in the state. The existing facility, Enviva Southampton, is located about 40 miles west of Norfolk, and the proposed facility will be just outside of Danville.

Table I. Annual Air Pollution from Exporting Pellet Mills in Virginia

	Annual Particulate Pollution	Annual CO Pollution	Annual Nitrogen Oxide Pollution	Annual VOC Pollution	Annual Total Pollution	Annual CO ₂ Pollution
Existing Plants (1)	88 tons	56 tons	163 tons	245 tons	552 tons	160,535 tons
Existing (1) and Proposed (1)*	223 tons	287 tons	383 tons	873 tons	1,776 tons	390,363 tons

*Emissions from the proposed Enviva Danville facility assume the new plant will have the same emissions as Enviva Sampson, the most recently-constructed Enviva plant.

After Discovering They Were Violating Limits, Enviva Southampton Actually Removed Pollution Control Technology

Enviva’s Virginia facility, located in Southampton County, was originally permitted as a synthetic minor source processing 90% softwood in 2012.⁶⁴ Predictably, after the Georgia Biomass testing showed facilities like this could not comply with their synthetic minor limits without additional controls, Enviva found that the Southampton facility was indeed emitting well above 250 tons per year.⁶⁵ Rather than installing additional control technology or reduce production like other companies have done, Enviva actually *removed* their VOC and hazardous air pollutant control technology (a regenerative thermal oxidizer) and switched to processing hardwoods.⁶⁶ While this did allow Enviva Southampton to begin complying with the VOC limit, it is far from environmentally sound given the larger ecological footprint of harvesting hardwood trees. Furthermore—and of particular importance to nearby residents—the removal of the regenerative thermal oxidizer means Enviva Southampton is no longer controlling its hazardous air pollutant emissions in any way, and the facility almost certainly emits major levels of hazardous air pollutants, triggering the Clean Air Act’s hazardous air pollutant requirements to install the maximum achievable control technology. Despite this, Virginia has not required any technology to reduce hazardous air pollutants. Worse yet, Virginia has not even required that Enviva test for hazardous air pollutants, so the true rates are impossible to know.

Rather than requiring emissions testing for hazardous air pollutants, a requirement found in almost every other state, Virginia has apparently relied on Enviva’s in-house estimates of the total amount of hazardous air pollutants emitted by the facility, estimates which are based on unsupported assumptions.⁶⁷ Enviva assumes that the difference in emissions for each individual hazardous air pollutant is uniform between hardwood and softwood, such that decreasing the amount of softwood processed will uniformly reduce each hazardous air

pollutant by an identical rate.⁶⁸ This is simply not true. Research and recent testing at other facilities indicates that drying hardwood actually emits certain hazardous air pollutants at higher levels than drying softwood.⁶⁹ At the very least, Enviva’s assumption that reducing softwood content will reduce each hazardous air pollutant at the same rate is not scientifically sound. Instead, EIP estimated emissions of hazardous air pollutants individually, based on how each pollutant is emitted at 100% softwood and at 50% softwood, because these are known emission rates available in EPA databases.⁷⁰ From there, EIP can make a reasonable extrapolation to 10% softwood (the rate the Enviva Southampton currently processes). For formaldehyde, this produced an emission rate of 16.2 tons per year from the dryer alone, well above the 10 tons per year threshold for utilizing maximum achievable control technology, and three times higher than Enviva’s own estimate for its dryer emissions of 5.87 tons per year.⁷¹ The increase in formaldehyde emissions also means the facility is exceeding the 25 ton per year threshold for total hazardous air pollutant emissions, at 31 tons per year.⁷²

Further, applying actual test results from a Georgia pellet mill that processes a similar ratio of hardwood shows that Enviva Southampton is almost certainly exceeding both its permit limits and the Clean Air Act’s maximum achievable control technology threshold.⁷³ Based on those tests, Enviva Southampton emits 21.2 tons per year of methanol and 16.5 tons of formaldehyde, and emissions of total hazardous air pollutants are at least 46 tons per year. These rates are substantially higher than the 10 ton per year threshold for individual hazardous air pollutants and 25 tons per year for total hazardous air pollutants, meaning the facility should be required to install maximum available control technology—a regenerative thermal oxidizer. Had Enviva retained the regenerative thermal oxidizer to control hazardous air pollutants, these emissions would be less than one ton per year of formaldehyde, and total hazardous air pollutant emissions would be less than three tons per year.

Florida

Florida only has only one wood pellet plant exporting to Europe, Enviva Cottondale located near Panama City, but the plant is the second largest pellet mill in the nation, producing more than 800,000 tons of pellets per year. The facility has correspondingly high emissions of air pollutants, as detailed below. A second facility, Cornerstone Biomass, is proposed in Florida, which would be located between Tallahassee and Gainesville.

Table J. Annual Air Pollution from Exporting Pellet Mills in Florida.

	Annual Particulate Pollution	Annual CO Pollution	Annual Nitrogen Oxide Pollution	Annual VOC Pollution	Annual Total Pollution	Annual CO ₂ Pollution
Existing Plants (1)	411 tons	22 tons	245 tons	517 tons	1,227 tons	229,336 tons
Existing (1) and proposed (1) plants*	511 tons	85 tons	370 tons	767 tons	1,733 tons	293,546 tons

*Emissions from the proposed Cornerstone Biomass facility estimated based on similar-sized facilities.

Enviva Plant Near Panama City Emits More than 500 Tons Per Year of VOCs Without a Required Permit or Sufficient Controls

Enviva Cottondale, formerly Green Circle Bio Energy, was one of the first facilities to test and find higher than expected VOC emissions after learning of the original Georgia Biomass testing in 2013. As with Georgia Biomass, the facility-wide VOC emissions were well over 1,000 tons per year, violating that facility's 250 ton per year permit limit and exceeding the major source threshold. While Florida did require the facility to take some action to reduce VOC emissions, the facility still emits more than 500 tons per year of VOCs because the facility's pellet coolers remain uncontrolled.⁷⁴

Despite Florida's acknowledgement in 2013 that Enviva Cottondale emits VOCs at more than twice the major source threshold, Florida did not require the facility to go through major source permitting until EIP and a coalition of concerned public interest organizations submitted comments on the facility's permit renewal in August of 2017.⁷⁵ In 2013, Florida had excused the facility from complying with major source requirements, including the use of best available control technology, in part because the original owners acted in "good faith" when they originally represented that hammermills and pellet coolers do not emit VOCs.⁷⁶ While Green Circle, the owners at the time, may have indeed acted in good faith when they operated the facility prior to knowing about the VOC emissions, the Clean Air Act does not contain an exception for pollution emitted in good faith. While EIP is glad to see that Florida is now requiring the facility to go through major source permitting, it is imperative that Florida require the use of the best available control technology for the facility's pellet coolers. Major source permitting requires an analysis of the best available control technology for each unit which emits a significant amount of a pollutant, and the pellet coolers currently have no controls at all. Given that the similar-sized Georgia Biomass has been able to reduce facility-wide VOC emissions to 130 tons per year by installing a regenerative catalytic oxidizer that controls pellet cooler emissions, Florida must require Enviva to utilize this control technology, or other technology that is equally effective.

South Carolina

South Carolina has two pellet plants which export to Europe, and up to four more are proposed in the state. The largest facility, Colombo Energy, is located just outside of Greenwood and has the capacity to produce 669,000 ton of pellets per year. The facility was built in 2016 by the Portuguese paper company Portucel Soporcel, but was acquired by Enviva Biomass in February of 2018. A smaller facility, Thunderbolt Biomass, is located in Allendale County. The four proposed plants include an Enviva plant in Laurens County and a Drax Biomass plant in Abbeville County, each with a production capacity of 550,000 tons per year.

Table K. Annual Air Pollution from Exporting Pellet Mills in South Carolina.

	Annual Particulate Pollution	Annual CO Pollution	Annual Nitrogen Oxide Pollution	Annual VOC Pollution	Annual Total Pollution	Annual CO ₂ Pollution
Existing Plants (2)	94 tons	244 tons	243 tons	786 tons	1,367 tons	218,347 tons
Existing (2) and Proposed (4) plants*	665 tons	876 tons	1,094 tons	2,742 tons	5,377 tons	984,822 tons

* Emissions from proposed plants based on recently constructed Drax and Enviva facilities.

Greenwood Facility Fails to Meet Testing Requirements, Fast-Tracks Inadequate Permit Behind Closed Doors

In February 2018, Enviva Biomass acquired the Colombo wood pellet manufacturing facility in Greenwood, South Carolina, with plans to more than triple production. The plant is permitted as a synthetic minor source, meaning that it is exempt from the Clean Air Act’s requirement that it reduce air pollution using best available control technology. However, the Colombo plant discovered recently that it generates far more VOC emissions than it previously thought, and that it was capable of emitting more than 600 tons of VOCs per year. At that time, plant operators started limiting the plant’s production to less than a third of its designed capacity to keep emissions to legal levels (the facility is designed to produce 669,000 tons per year, and Colombo has been operating at less than 200,000 tons per year). Now, Enviva has publicly stated that it wants to increase actual production to 660,000 tons per year, and to do that, the plant must install controls to reduce its VOC emissions.⁷⁷ While Enviva plans to install controls on some of the plant’s VOC-emitting sources, it does not plan to install controls on its hammermills. As a result, the facility would still emit more than 300 tons per year of VOCs when operating at the capacity Enviva desires.⁷⁸ Based on its potential emissions, even with the new controls the plant plainly qualifies as a major source which must utilize the best available control technology on all of its sources. Instead, South Carolina issued a permit with no public notice or opportunity to comment which did not contain a production limit necessary to restrict the facility’s emissions to legal levels.⁷⁹ In response to pressure from EIP and other groups, the facility agreed to amend their permit to include an enforceable production limit of 500,000 metric tons.

Another troubling issue with the Colombo facility is that it has utterly failed to conduct required emission testing, and one set of tests the facility submitted to South Carolina borders on criminally deficient. After first failing to meet the permit deadline to submit testing within 180 days of start-up, Colombo eventually sent South Carolina test results that anyone familiar with emissions from wood pellet manufacturing plants could tell were wildly inaccurate. That testing underrepresented VOC emissions from the facility’s pellet coolers by at least 259 tons per year, conveniently showing that the facility could operate at full production rates without exceeding the major source threshold.⁸⁰ Eventually, even Colombo acknowledged these tests were flawed, and arranged for a different consultant to perform a new round of testing in October 2017. The new testing showed significantly higher VOC emissions from the facility’s pellet coolers: 370 tons per year compared to the original test’s result of 111 tons per year.⁸¹ However, this subsequent testing also failed to

fulfill Colombo’s testing obligation because Colombo did not follow proper procedures regarding planning and notification. Colombo’s permit and South Carolina regulations set out numerous requirements for emission testing, including prior approval of a site-specific test plan and notification to South Carolina officials of the test date. Notification of the test date is crucial, because it allows South Carolina officials the ability to observe the testing. Despite these legal requirements, Colombo conducted its tests without notifying South Carolina and without an approved site-specific test plan.⁸² This means the tests were conducted without approval and without any outside observers. While the facility may conduct proper testing in the future, the fact remains that South Carolina has allowed the facility to operate for 18 months without satisfying its requirement to conduct legitimate emissions testing.

Georgia

Georgia is home to five pellet mills exporting to Europe, and four more proposed facilities have either received permits or are under construction. The two largest mills, Georgia Biomass in Waycross, and Hazlehurst Wood Pellets in Jeff Davis County, produce more than 1.3 million tons of wood pellets per year. While Georgia was the first state to recognize the VOC issue from pellet mills and has generally done the best of any state to address the issue, permits in the state still allow for facilities to emit more VOCs and hazardous air pollutants than the Clean Air Act allows without installing pollution controls.

Table L. Annual Air Pollution from Exporting Pellet Mills in Georgia.

	Annual Particulate Pollution	Annual CO Pollution	Annual Nitrogen Oxide Pollution	Annual VOC Pollution	Annual Total Pollution	Annual CO ₂ Pollution
Existing Plants (5)	499 tons	510 tons	584 tons	999 tons	2,592 tons	649,836 tons
Existing (5) and Proposed (4) plants*	1,138 tons	1,259 tons	1,357 tons	1,932 tons	5,686 tons	1,233,545 tons

* Emissions from proposed plants based on permitting materials and similar facilities.

Georgia Permits Lack Enforceable Pollution Limits.

Permits for at least two facilities, Appling County Wood Pellets near Brunswick and Varn Wood Pellets near Waycross, fail to require best available control technology, or alternatively, fail to adequately limit emissions. At Appling County Pellets, which does not utilize any pollution controls for VOCs, the permit lacks any facility-wide VOC limit. While the latest draft permit does contain a production limit, which is a step in the right direction, the production limit fails to ensure the facility will not emit more than 250 tons per year of VOCs. This is because the facility could exceed 250 tons per year of VOCs even while producing less than the production limit. Georgia relied on emission factors—rates of pollution emitted per ton of product produced—to show that the production limit contained in the permit would keep emissions below 250 tons per year. The problem is, those emission factors are based on stack testing which does not adequately represent the maximum emissions. The facility processed mostly hardwood during the testing, but could process up

to 100% softwood if it desired, because the permit does not restrict the softwood processed at the facility. Softwood emits substantially more VOCs than hardwood, and at the current production limit the facility would emit 540 tons per year of VOCs if it processed 100% softwood. Georgia must therefore implement facility-wide VOC limit. The problem with Varn Wood Pellets’ permit is basically the opposite of that at Appling County: the permit contains a facility-wide limit on VOCs, but no production limit. For facilities like Varn Wood Pellets, which do not utilize adequate pollution controls to reduce VOC emissions below the major source threshold when operating at full capacity, permits must restrict production to a point where emissions are below the major source threshold. In response to comments submitted by EIP on behalf of other environmental groups, Georgia has proposed to issue a new permit that will contain a production limit.

Pellet Mill Near Valdosta Begins Construction Without Permit.

Under the Clean Air Act and Georgia law, it is illegal to commence construction of a source of air pollution without obtaining a permit. Blue Sky Biomass, however, ignored the law and began constructing a 400,000 ton per year pellet mill north of Valdosta, Georgia. The company’s website shows considerable concrete work, and the installation of at least four pellet presses. Georgia officials have apparently not taken action to halt construction or require the facility to apply for a permit. Because the facility has not applied for a permit, it is impossible to know exactly how the facility will be designed and whether it will adequately control for VOC and hazardous air pollutants.

Alabama

Alabama hosts three pellet mills exporting to Europe, including Zilkha Biomass, near Selma, and Mohegan Renewable Energy (formerly Lee Energy Solutions) near Birmingham. Three new mills are proposed in the state, including two large Enviva plants—Enviva Childersburg outside of Birmingham, and Enviva Abbeville, north of Dothan.

Table M. Annual Air Pollution from Exporting Pellet Mills in Alabama.

	Annual Particulate Pollution	Annual CO Pollution	Annual Nitrogen Oxide Pollution	Annual VOC Pollution	Annual Total Pollution	Annual CO ₂ Pollution
Existing Plants (3)	499 tons	510 tons	584 tons	999 tons	2,592 tons	649,836 tons
Existing (3) and Proposed (3) plants*	1,138 tons	1,259 tons	1,357 tons	1,932 tons	5,686 tons	1,233,545 tons

* Emissions from proposed plants based on permitting materials and similar facilities.

Pellet Mill in Selma Vastly Exceeds Limits on Carbon Monoxide and VOC Emissions.

The Zilkha Biomass mill just east of Selma is regulated as a minor air pollution source based on permit restrictions that serve to limit facility-wide emissions of pollutants like VOCs and carbon monoxide to below the major source threshold of 250 tons per year. When Zilkha Biomass first conducted emissions testing in 2017, however, the tests revealed that the

facility emits 456 tons of CO per year when operating at the plant’s design capacity—nearly twice the major source threshold. This means the facility has triggered the Clean Air Act’s New Source Review requirements for major sources, including the obligation to install the best available control technology. This technology would likely be a regenerative catalytic oxidizer.

The facility is also almost certainly a major source of VOCs. The permit improperly exempts units known as hammermills and pellet coolers from emissions testing requirements, so the true rate is not known. However, emissions testing from every comparable wood pellet mill shows these units emit hundreds of tons more VOCs than Alabama believes. Emission factors from tests at a pellet mill in Georgia show Zilkha’s hammermills and pellet coolers emit between 450 and 570 tons per year; emission factors from tests at a mill in Florida show these units emit 487 tons per year, and emission factors from tests at a mill in South Carolina show these units emitting 316 tons per year. Given that the wood dryer and the facility’s unique and proprietary “black pellet” system also emit substantial amounts of VOCs, it is simply not plausible that Zilkha’s facility-wide VOC emissions are below the 250 ton per year major source threshold.

Alabama Facility Emitted Twice as Much Particulate Matter Pollution than Permitted and Exceeded the Title V Threshold Without Obtaining a Title V Permit.

Until late 2017, Lee Energy Solutions was a wood pellet manufacturer northeast of Birmingham (the facility is now owned and operated by Mohegan Renewable Energy). The facility has a capacity of 225,000 tons per year, although operations are limited to 150,000 tons per year in an attempt to avoid Title V permitting.⁸³ Unfortunately, even at this lower rate, the facility has violated both its permit limits and the Title V threshold for particulate emissions. In fact, the facility emitted more than double its hourly permit limits of particulates, and emitted 189 tons of particulates per year, well above the Title V threshold of 100 tons per year.⁸⁴ The facility claimed that the issue was a poorly functioning multicyclone control device on the dryer. Multicyclones are relatively low-tech devices which can be efficient at removing large particulates but remove 10% or less of the smallest particulates, which are the deadliest.⁸⁵ While a faulty multicyclone may have contributed somewhat, the larger issue is that the facility was utilizing only a multicyclone rather than control technology with much better removal capacity. All of the large facilities EIP surveyed utilize a particulate matter control device known as a wet electrostatic precipitator, which removes 99% of all particulate matter, and at least 90% of fine particulates (PM_{2.5}).⁸⁶ Many smaller facilities like Lee Energy do not utilize this technology, and consequently have higher than necessary particulate matter emissions.

Arkansas

Arkansas is home to one wood pellet facility currently operating, the Highland Pellets mill in Pine Bluff, and two proposed mills which have applied for or received initial construction permits (Zilkha Biomass in Monticello, and Highland Pellets South, in Ouachita County).

Table N. Annual Air Pollution from Exporting Pellet Mills in Arkansas.

	Annual Particulate Pollution	Annual CO Pollution	Annual Nitrogen Oxide Pollution	Annual VOC Pollution	Annual Total Pollution	Annual CO ₂ Pollution
Existing Plants (1)*	174 tons	191 tons	201 tons	245 tons	811 tons	238,510 tons
Existing (1) and Proposed (2) plants*	631 tons	631 tons	651 tons	739 tons	2,652 tons	655,902 tons

* All emissions are estimates from permit reviews or applications, Highland Pellets has not submitted stack testing.

Arkansas Fails to Require Crucial Emissions Testing at Pine Bluff Mill

The Highland Pellets mill is one of the newer and larger mills constructed, and it controls VOC and hazardous air pollutants from most of its units by routing emissions to the wood dryer’s furnace. This process generally achieves 90% destruction of VOCs and hazardous air pollutants. The problem is, Highland Pellets does not do this for its pellet cooler emissions.⁸⁷ As noted above, pellet coolers can be massive sources of VOC emissions, with uncontrolled pellet coolers at some facilities emitting around 500 tons of VOCs per year (see the Table H above). These rates would mean Highland Pellets is greatly exceeding the 250 ton per year major source threshold as well as its permit limits. Despite this fact, Arkansas has not required emissions testing for VOCs from the pellet coolers—in fact the pellet coolers are the only major unit that is not required to test for VOCs. Given that the total VOC emissions for the plant are estimated to be up to 245 tons per year, the facility only has a 5 ton per year margin of error to avoid exceeding the major source threshold.⁸⁸ Therefore, the true rate of VOC emissions from the pellet coolers is crucial to ensuring the facility does not exceed the major source threshold; yet Arkansas has inexplicably exempted these particular units from testing requirements.

Piles of Wood Smolder Endlessly at Pine Bluff Pellet Mill

In addition to the potential VOC issue identified above, the Highland Pellets mill in Pine Bluff has had major issues with smoke emissions. When nearby residents complained, stating that “smoke was leaving the site and blanketing the surrounding community,” Arkansas officials inspected the site but apparently did not take any corrective action.⁸⁹ According to the inspection, wood piles at the facility smolder and emit smoke continuously. The inspector’s report states: “As you drive by the property you will see several large piles of material . . . This morning, both of these kinds of piles were smoking, or more accurately, smoldering. Normal rainfall amounts do a good job of keeping the temperature inside the pile down and the wood wet enough to keep the smoldering in check. With the severe lack of rain this fall, that was evidently not the case and the smoke was worse than normal.”⁹⁰

Improperly stored wood chips will frequently spontaneously combust, as large piles of decomposing wood produce heat. The smoke from this combustion is particularly harmful, as the low heat and incomplete combustion produces substantially higher levels of

particulate matter, carbon monoxide, and VOCs than other forms of burning wood.⁹¹ Studies have shown that smoldering pine emits 75 times more particulate matter pollution and 7 times more carbon monoxide than flaming fires.⁹² In addition to the smoke, smoldering wood chips present an obvious risk of larger fires. As discussed in Part Three below, fires are a common problem at wood pellet industries. Highland Pellets has already had one fire since commencing operations in 2017.

Part Two: Enviva is a Clear Outlier, Failing to Utilize Pollution-Reducing Controls Which are Standard in the Industry.

As discussed above, most large pellet mills utilize at least a regenerative thermal oxidizer or other control device on their dryer. The only exceptions are facilities owned and operated by Enviva Biomass. Most of these are located in North Carolina, where the state has repeatedly allowed Enviva to avoid reducing pollution. EIP's survey of new-generation pellet mills in the nation reveals that regenerative thermal oxidizers or other control technology are fundamental control devices which greatly reduce VOCs, yet Enviva has consistently claimed such controls are too expensive to install.⁹³ The fact is, however, that Enviva's competitors are able to utilize controls not only on their dryers, but frequently on additional units as well.

Two of Enviva's mills, Enviva Sampson (constructed in 2017) and Enviva Hamlet (under construction), both of which are near Fayetteville, North Carolina, are subject to the Clean Air Act's "best available control technology" and "maximum available control technology" requirements. Under both requirements, the facility is required to reduce emissions to the level achieved by the best-controlled pellet mill in operation. Despite these requirements and the fact that other facilities do use very effective pollution controls, the two Enviva facilities utilize no control devices whatsoever for VOCs or hazardous air pollutants. Each facility will emit more than 600 tons of VOCs and more than 50 tons of hazardous air pollutants once they reach full operation. Had the facilities actually complied with the Clean Air Act's control technology requirements and installed controls used by other pellet mills, each plant would emit less than 100 tons of VOCs and less than three tons of hazardous air pollution per year.

Table O below shows VOC controls on wood dryers at the largest wood pellet mills in the country. Notably, the only Enviva plants which do utilize controls, Enviva Cottondale and the Colombo plant, were built by previous owners. Enviva acquired both plants after states had required the facilities to utilize controls.

TABLE O. ENVIVA’S FAILURE TO CONTROL DRYER VOC EMISSIONS MAKES THEM THE DIRTIEST IN THE INDUSTRY.

VOC Controls on Dryers at Pellet Mills Above 300,000 Tons Per Year Production Rate					
Facility	State	Production Capacity	VOC Controls on Dryer?	Current Softwood Percent	Dryer VOC Emissions (in tons per year)
Enviva Sampson	NC	535,000	No	75%	306
Enviva Hamlet (proposed and permitted)	NC	535,000	No	75%	306
Enviva Ahoskie	NC	420,000	No	30%	164
Enviva Cottondale	FL	821,000	Yes (RTO)	100%	136
Enviva Northampton	NC	628,179	No	30%	135
Drax LaSalle	LA	500,000	Yes (RTO)	100%	128
Enviva Southampton	VA	535,000	No	10%	122
Georgia Biomass	GA	826,000	Yes (RTO)	100%	55
Zilkha Monticello (proposed and permitted)	AR	661,000	Yes (RTO)	100%	51
Hazlehurst	GA	525,600	Yes (Sent to burner) ^A	100%	32
Highland Pellets	AR	500,000	Yes (Sent to burner) ^A	100%	22
Highland Pellets South (proposed, permit application submitted)	AR	500,000	Yes (Sent to burner) ^A	100%	22
German Pellets	TX	578,000	Yes (RTO)	100%	21
Westervelt	AL	320,000	Yes (RTO)	100%	20
Colombo (Now Enviva Greenwood)	SC	669,000	Yes (RTO)	100%	13
Zilkha	AL	300,000	Yes (RTO)	50-100% ^B	9
Drax Amite	MS	578,000	Yes (RTO)	100%	7
Drax Morehouse	LA	500,000	Yes (RTO)	98%	6

A. Emissions are routed to the furnace for VOC and HAP destruction, achieving 90% reduction

B. Facility processes a range of softwood, but is permitted as if it processed 100% softwood

Part Three: Fires and Explosions

Wood pellets are designed to burn as efficiently as possible, so it shouldn’t be surprising that the facilities manufacturing and storing wood pellets face a substantial risk of fires and explosions. What is surprising, however, is just how common and severe these fires and explosions are.⁹⁴ Of the 15 new generation pellet mills EIP surveyed, at least eight have had fires or explosions since 2010, including several resulting in injuries.⁹⁵ A “flash fire” at the Hazlehurst pellet mill in Hazlehurst, Georgia—the facility’s second fire since commencing operations in 2014—seriously injured four employees.⁹⁶ The Westervelt wood pellet mill in Tuscaloosa, Alabama had an explosion in 2016 which injured an employee.⁹⁷ Enviva has had news-worthy fires at its Florida facility (Enviva Cottondale near Panama City), two fires at its Virginia facilities (Enviva Southampton and its port storage facilities, both in or

near Chesapeake), and a North Carolina facility (Enviva Ahoskie north of Greenville).⁹⁸ German Pellets Texas alone had fires or explosions in April 2014, April 2015, May 2015, and February 2017, culminating in a two-month long fire in 2017 at German Pellets storage's silo in Port Arthur, Texas.⁹⁹ The silo ultimately collapsed, and smoke from the smoldering pellets caused dozens of Port Arthur residents to seek medical attention. The city of Port Arthur and residents have filed multiple lawsuits over the fire, and a court has ordered German Pellets to empty all of its silos and install proper fire-fighting technology. During the process of removing the pellets, a worker was killed when a pile of wood pellets collapsed.

Fires in silos can be particularly difficult to fight, as the German Pellets silo fire demonstrated. Fires can start deep in the silo under many tons of wood pellets thanks to spontaneous combustion, a common phenomenon when a large amount of wood is not properly stored, due to the heat generated from decomposing wood and lack of ventilation. Once a silo fire begins, it may burn for days, weeks, or months. Water is usually ineffective in fighting these fires, as water causes the top layer of pellets to expand, creating an impenetrable crust, preventing water from reaching the fire itself. In the case of the German Pellets fire, even after the silo collapsed more than a month after the fire began, fire fighters still struggled for weeks to stop the fire.¹⁰⁰ In another instance, after a fire burned for four days at a small pellet mill in West Monroe, Louisiana and injured a firefighter, the local fire chief reported that the fire was very difficult to extinguish, and that "there was really no safe way to do it quickly with a lot of wood chips smoldering and smoking."¹⁰¹ The uncontrolled burning of so much wood biomass accounts for huge amounts of harmful air pollution.

Beyond fires, explosions also occur. The primary culprit of explosions at wood pellet facilities is airborne wood dust, which is generated at all stages of manufacturing, storage, and transporting of wood pellets. Once this fine dust is suspended in the air it is extremely combustible. For instance, a 2011 blast at Georgia Biomass in Waycross, Georgia, rattled windows up to five miles from the facility.¹⁰² While mills in the U.S. South have thus far escaped fatal explosions, an employee was killed by a dust explosion at a mill in British Columbia in 2012.¹⁰³

The Clean Air Act addresses the risk of fires and explosions, yet many states are not fully implementing the Act's provisions in order to best reduce the risk. The Clean Air Act contains a General Duty Clause which requires facilities producing or handling extremely hazardous substances to design, maintain, and operate their facilities in a safe manner.¹⁰⁴ As the long list of fires and explosions at wood pellet facilities show, wood dust qualifies as an extremely hazardous substance.¹⁰⁵ Unfortunately, permits issued to wood pellet manufacturing plants either fail even to mention the General Duty Clause, or provide only brief, non-specific references to it which do not discuss measures the facility needs to take to properly manage combustible dust. This is insufficient to prevent fires and explosions, and instead EIP believes permits must state that the General Duty Clause applies to the facility's handling of explosive dust and require the facility to perform specific steps that are sufficient to ensure that workers and others who live, work, recreate, or simply commute in the facility's vicinity are protected from the dangers posed by combustible dust. At a minimum, the permits should:

- (1) Identify the Clean Air Act's General Duty Clause as an applicable requirement with respect to the facility's handling of combustible dust.
- (2) Specifically require the facility to prepare a hazard analysis identifying the hazards associated with explosive dust and the facility's processes, potential fire and explosion scenarios, and the consequences of a fire or explosion.
- (3) Establish specific design and operation standards that the facility must meet to prevent a dust-related fire or explosion.
- (4) Establish recordkeeping and reporting requirements sufficient to demonstrate that the facility is meeting its General Duty Clause obligations.

Implementing these more specific requirements will not only aid in preventing releases of air pollution, but will serve to protect workers and neighbors from harm. Plant managers will benefit too, as EPA has brought enforcement actions against plants for failure to comply with the General Duty clause after accidents, and plant managers have responded that they were not aware of the Clause or its full requirements.

Conclusion and Recommendations

The Clean Air Act only works to protect health and the environment when state agencies are fully implementing all of the Act's requirements. EIP calls on state agencies across the U.S. South to address the errors and omissions identified in this report, and to further make proactive moves to better understand and control emissions from this emerging industry in the future. EIP makes the following recommendations as initial steps to remedy the numerous deficiencies identified in this survey:

1. **Reexamine existing air permits and reissue stronger permits where needed.** Many of the air permits for wood pellet mills were issued before permitting agencies fully understood the scope of VOC and hazardous air pollutant emissions from the industry. These permits allow facilities to exceed the Clean Air Act's major source threshold and are legally deficient. States should take a careful look at permits for wood pellet mills and assess whether the existing permits account for VOC and hazardous air pollutant emissions from each of the major units at the facility. Where exceedances exist, states should take immediate action to ensure facilities cease violating pollution limits.
2. **Require "major" sources of air pollution to install the best available control technology.** As this report reveals, many pellet mills with major source permits evade using the best available control technology, or any control technology at all, while facilities with minor source permits, often the same size or larger, do utilize controls. This is an unacceptable perversion of the Clean Air Act. States must require facilities with major source permits to reduce emissions to at least the level achieved by the best-controlled minor source facility.
3. **Institute production limits at minor source facilities.** Court decisions and EPA guidance dictate that production limits are necessary aspects of ensuring that

facilities do not exceed the major source threshold. This is especially vital at minor source facilities which do not utilize sufficient controls to keep their emissions below legal limits when operating at full capacity. If a facility can exceed legal limits when operating at or near maximum production rates, states must require production limits that ensure the facility does not emit more pollution than legally allowed. Further, production limits allow state agencies and the public a reasonable method to determine whether a facility is exceeding Clean Air Act thresholds. Although a few permits EIP surveyed do incorporate production limits, the overwhelming majority of permits which should have production limits do not and are therefore legally deficient.

4. **Ensure Communities are Notified of and Able to Participate in Permitting Decisions.** As noted above, several permits allowing the construction or modification of wood pellet plants were issued without public notice. Communities near the proposed facilities were not adequately informed of the decision to allow sources of air pollution to locate in their backyard. States should revise their regulations and procedures to include public notice and opportunity for meaningful input from those most affected by a plant's air pollution.
5. **Require annual emissions testing.** Many permits rely on emissions estimates—frequently outdated and inaccurate—rather than source-specific emissions testing to determine the level of air pollution emitted from wood pellet mills. This is especially true for VOC and hazardous air pollution, and from units other than the wood dryer such as pellet coolers and hammermills. While continuous emissions monitoring is the best method to determine actual levels of pollution emitted, where states do not require this they must at least require annual testing of each of the major units at pellet mills for volatile organic compounds and hazardous air pollutants.
6. **Reduce the risk of fires and explosions.** Fires and explosions from wood dust plague the wood pellet industry, and the Clean Air Act gives states a powerful tool to address the problem in the General Duty Clause. States must begin utilizing the General Duty Clause effectively and require facilities to comply with their general duty under the Clean Air Act to design and maintain a safe facility.

Appendix A: Clean Air Act Permitting in the Context of Wood Pellet Manufacturing.

This Appendix provides a brief primer on the basic framework of the Clean Air Act and how it applies to the wood pellet industry. The Clean Air Act requires sources of air pollution to obtain various types of permits based on the amount and type of pollution emitted, as well as the nature and location of the source. These permits generally contain emission limits, operating standards, or other requirements to protect air quality. One key thing to remember is that these permitting programs are primarily administered by state environmental agencies, and while the federal EPA has some oversight, the vast majority of decision-making and enforcement occurs at the state level. This means that permits and enforcement can vary considerably from state to state.

State Construction Permits

In general, sources of air pollution must obtain at least a state permit to construct and operate a new source of air pollution. These permits may or may not be open to public notice and comment, and states are relatively free to issue these permits on their own terms. Unless a facility triggers one of the other types of permits, this may be the only permit a facility needs. Wood pellet plants, especially large export-based plants, need additional permits due to their high emission rates.

Title V Permits

Title V of the Clean Air Act establishes a federal operating permit program. Title V permits incorporate all legal requirements for air pollution that apply to a facility into a single permit. Most importantly, Title V permits require facilities to demonstrate how they will comply with each of the legal requirements, with conditions for monitoring, record keeping, and reporting. Facilities which emit or have the potential to emit more than 100 tons per year of any regulated pollutant, 25 tons per year of HAPs, or 10 tons per year of any single HAP must apply for a Title V permit within a year after they begin operation. Large wood pellet facilities all emit VOCs, and frequently other regulated pollutants or HAPs, above the Title V threshold, so every facility in this report has at least a Title V permit. Finally, although Title V is a federal operating permit in that the requirements are specified by the Clean Air Act, responsibility for the issuance and enforcement of these permits rests mostly with state agencies.

New Source Review and Prevention of Significant Deterioration Permits

New Source Review is the Clean Air Act's permitting program designed to limit emissions from large sources of air pollution by requiring a permit before a "major source" begins construction or undertakes a modification. Although EPA has created a stricter definition of "major source" for many industries (a facility with the potential to emit 100 tons per year of a regulated pollutant), for wood pellet mills, "major source" means a facility with the potential to emit more than 250 tons per year of a regulated pollutant. It is worth pointing out that the threshold is based on potential emissions rather than actual emissions, so even if a facility usually operates at 75% capacity, the relevant emissions are those produced while operating at 100% capacity.

New Source Review consists of several types of permits, but the permit at issue in the wood pellet industry is known as a Prevention of Significant Deterioration (PSD) permit. PSD permitting requires facilities to conduct impact analyses, air dispersion modelling, and other protective steps, but the heart of PSD permitting is the “best available control technology” requirement. On a technical level, PSD does not actually require a facility to install the best available control technology, but it does require a facility to limit emissions to the level achievable by using the best available control technology. In practice, however, PSD is synonymous with utilizing the best available control technology, and permitting agencies are supposed to select the best available control technology on a case-by-case basis and implement corresponding emission limits.

PSD permitting is meant to be rigorous, and most of the wood pellet industry has attempted to remain below the 250 ton per year threshold to avoid it (see the section on synthetic minor limits below). Only three facilities have gone through New Source Review and PSD permitting before construction: Enviva Hamlet, Enviva Sampson, and Drax LaSalle. Two other facilities, German Pellets and Enviva Cottondale, are currently going through PSD permitting after discovering they were exceeding 250 tons per year of VOCs. Many of the issues revealed in EIP’s survey involve facilities either exceeding the 250 ton per year threshold and not going through PSD, or states failing to select controls which are widely used in the industry as the best available control technology.

Hazardous Air Pollutants and Permitting

Hazardous air pollutants (HAPs) are those pollutants which EPA considers especially toxic or carcinogenic, and are more strictly regulated under the Clean Air Act. Unlike the permits discussed above, there is no unique permit needed to emit HAPs; instead, facilities which have the potential to emit more than 10 tons per year of any single HAP, or more than 25 tons per year of all HAPs combined, must apply for a Title V permit and utilize the maximum achievable control technology, which is meant to be stricter than other requirements such as PSD’s best available control technology. For most industries, EPA has promulgated national standards and limits which represent the maximum achievable control technology. The wood pellet industry, however, is so new that EPA has not established any standards. This means it is up to the states to develop, on a case-by-case basis, maximum achievable control technology standards and emissions limits for wood pellet facilities. Unfortunately, for facilities which qualify, states have frequently failed to require any control technology at all, and several facilities emit substantially more HAPs than they would if states actually required maximum achievable control technology.

Synthetic Minor Sources

Each of the above permitting realms has a triggering pollution threshold, e.g. 250 tons per year of any PSD pollutant. The key to these thresholds is that they are triggered by the *potential* to emit that pollutant, rather than whether a facility actually emits more than the threshold in a given 12-month period. Facilities with such a potential are known as “major sources,” for example a facility which has the potential to emit more than 100 tons per year of a regulated pollutant is a major source in terms of Title V permitting. Facilities which have a potential to emit above a given threshold but wish to avoid the stricter permitting can

opt to take limits to remain a minor source. These are known as “synthetic minor limits” because the facility is not truly a minor source, but will be treated as such if it complies with the limit. To be valid synthetic minor limit, the limit must be enforceable, ideally in terms of a production or operating limit. A good example would be a facility which would emit 275 tons per year of VOCs when operating at a production rate of 400,000 tons per year (and would therefore be a major source for PSD), but takes a legal limit which restricts operations to just 350,000 tons per year, which lowers VOC emissions to below 250 tons per year. Most wood pellet facilities are permitted as synthetic minor sources for PSD, but only have a blanket emission limit in their permits, such as “the facility shall emit less than 249 tons per year of VOCs,” rather than an actual production limit. Unfortunately, such blanket limits are difficult to enforce in the real world if a facility does not accurately understand its rate of emissions. This is why many large pellet mills were in fact exceeding their 249 ton per year limits, because states and the industry did not realize that many units emitted much more VOCs than they believed.

Notes

¹ Florida has agreed to require Enviva Cottondale wood pellet plant to go through major source permitting in response to recent comments submitted by EIP. It remains to be seen whether Florida will require the best available control technology, despite the fact that the Clean Air Act requires it.

² Dogwood Alliance, Natural Resources Defense Council, Southern Environmental Law Center, “European Imports of Wood Pellets for “Green Energy” are Devastating US Forests,” https://www.dogwoodalliance.org/wp-content/uploads/2017/05/NRDC_2014-2017Booklet_DigitalVersion-resize.pdf; Drouin, Roger, “Wood Pellets: Green Energy or New Source of CO₂ Emissions,” *Yale Environment* 360 (Jan. 22, 2015), http://e360.yale.edu/features/wood_pellets_green_energy_or_new_source_of_co2_emissions.

³ Copley, Andrew. “Wood Bioenergy Update and Wood Pellet Exports: Q1 2017,” Forisk Consulting (Feb. 17, 2017), <http://forisk.com/blog/2017/02/17/wood-bioenergy-update-wood-pellet-exports-q1-2017/>; National Renewable Energy Laboratory, Energy Analysis, International Trade of Wood Pellets,(DATE), available at <https://www.nrel.gov/docs/fy13osti/56791.pdf>.

⁴ Campilho, Pedro. “The Asian Biomass Market: Challenges and Opportunities Ahead.” *Biomass Magazine*, November 30, 2017. <http://biomassmagazine.com/articles/14854/the-asian-biomass-market-challenges-and-opportunities-ahead>.

⁵ Science Advisory Board Review of EPA’s Accounting Framework for Biogenic CO₂ Emissions from Stationary Sources 7 (Sept. 28, 2012); “Letter from Over 100 Scientists to North Carolina Governor Roy Cooper,” November 14, 2017; Mitchell, S.R. et al., Carbon debt and carbon sequestration parity in forest bioenergy production. *Global Change Biology Bioenergy* 4: 818-827 (2012); Schulze, E.-D. et al., Large-scale bioenergy from additional harvest of forest biomass is neither sustainable nor greenhouse gas neutral. *Global Change Biology Bioenergy* 4: 611-616 (Apr. 2, 2012); McKechnie, J. et al., Forest bioenergy or forest carbon? Assessing trade-offs in greenhouse gas mitigation with wood-based fuels. *Environ. Sci. Technol.* 45: 789-795 (2011); Repo, A. et al., Indirect carbon dioxide emissions from producing bioenergy from forest harvest residues. *Global Change Biology Bioenergy* 3: 107-115 (2010); Gunn, J., et al., Manomet Center for Conservation Sciences, Massachusetts Biomass Sustainability and Carbon Policy Study: Report to the Commonwealth of Massachusetts Department of Energy Resources (2010).

⁶ Koester, Stefan and Davis, Sam, Siting of Wood Pellet Production Facilities in Environmental Justice Communities in the Southeastern United States. *Environmental Justice* (ahead of print) (Jan. 2018).

⁷ Dogwood Alliance, Wetland Logging Investigation Southampton, VA & Ahoskie, NC: May 13/14th, 2015, <https://www.dogwoodalliance.org/wp-content/uploads/2015/06/Wetlands-Logging-Investigation-Flyer.pdf>.

⁸ Qian Di, M.S. et al., Air Pollution and Mortality in the Medicare Population. *New England Journal of Medicine* 377:15, 1497-1499. (2017), <http://www.nejm.org/doi/full/10.1056/NEJMoa1702747>.

⁹ For instance, German Pellets Texas reports 63 tons per year in its PSD application, Enviva Northampton reports 75 tons per year in their Title V Permit application, and Enviva Southampton reports 77 tons per year in their Title V Permit Application. See German Pellets Texas Permit Amendment Application, Permit No. 98014, (Sep. 2016); North Carolina DAQ Application Review for Enviva Pellets Northampton, Permit No. 10203T06; Enviva Pellets Southampton Title V Permit Application, Permit No. 61653 (Jan. 4, 2016).

¹⁰ Revised PSD Air Quality Construction and Operating Permit Application for Enviva Pellets Sampson, August, 2014; PSD Air Quality Construction and Operating Permit Application for Enviva Hamlet, January, 2014.

¹¹ EPA, Air Pollution Control Technology Fact Sheet for Regenerative Incinerator. EPA-452/F-03-021.

¹² See *supra*, note 10; see also North Carolina DEQ Application Review Including Final Determination for Enviva Pellets Sampson (Nov. 17, 2014); North Carolina DEQ Application Review Including Final Determination for Enviva Pellets Hamlet (Mar. 29, 2016).

¹³ Revised PSD Air Quality Construction and Operating Permit Application, Enviva Pellets Sampson, Prepared by Trinity Consulting (Aug. 2014), § 4.4.3.5. (“RTO abatement technology is deemed to be cost prohibitive”); see also PSD Air Quality Construction and Operating Permit Application, Enviva Pellets Hamlet, Prepared by Trinity Consulting (Jan. 2015), § 4.4.3.5 (“RTO abatement technology is deemed to be cost prohibitive”).

¹⁴ Compare, for instance, AP-42 emission factors for particle board dryers at 100% softwood of 4.9 lb/ODT to 100% hardwood at .24 lb/ODT. (AP-42 § 10.6.2, Table 10.6.2-3).

¹⁵ EPA Air Pollution Control Technology Fact Sheet, Regenerative Incinerator, EPA-452/F-03-021.

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- ¹⁶ Sterman, John et al., Does Replacing Coal with Wood Lower CO2 Emissions? Dynamic Lifecycle Analysis of Wood Bioenergy. *Environ. Res. Lett.* 13 (2013); UK Department of Energy and Climate Change, Life Cycle Impacts of Biomass Electricity in 2020 at 12-13 (July 2014).
- ¹⁷ Forest Stewards Guild, Ecological Forestry Practices for Bottomland Hardwood Forests of the Southeastern U.S., May 2016, http://www.forestguild.org/publications/research/2016/FSG_Bottomland_Hardwoods.pdf.
- ¹⁸ *Id.*
- ¹⁹ U.S. EPA, Integrated Risk Information System.
- ²⁰ *Ass'n of Irrigated Residents v. Fred Schakel Dairy*, 634 F.Supp.2d 1081 (E.D. Cal., 2008), *see also American Forest and Paper Association v. EPA*, 294 F.3d 113, 118-119 (D.C. Cir. 2002).
- ²¹ *See* Table O, showing control devices on dryers at the facilities surveyed by EIP. Only Enviva facilities operate without an RTO or similar device.
- ²² Memorandum from Manny Patel, Georgia EPD, to Eric Cornwell, Georgia EPD, entitled “Emission Factors for Wood Pellet Manufacturing” (Jan. 29, 2013), containing stack testing results from Georgia Biomass showing 95% reduction of formaldehyde, acetaldehyde, and methanol with the use of an RTO.
- ²³ *See supra*, note 15.
- ²⁴ North Carolina DEQ Air Quality Permit for Enviva Northampton, Permit No. 10203R00 (Mar. 9, 2012).
- ²⁵ *Id.* at 11.
- ²⁶ Application to Modify Air Permit No. 10203R03 for Enviva Pellets Northampton (May 2015).
- ²⁷ North Carolina DEQ Air Quality Permit for Enviva Northampton, Permit No. 10203R04 (Oct. 12, 2015).
- ²⁸ North Carolina State Implementation 15A NCAC 2D .0530(i) (“[w]hen a particular source or modification becomes a major stationary source or major modification solely by virtue of a relaxation in any enforceable limitation which was established after August 7, 1980 on the capacity of the source or modification to emit a pollutant ... then the provisions of [North Carolina’s PSD regulations] shall apply to the source or modification as though construction had not yet begun on the source or modification.”). The most recent version of North Carolina’s PSD regulations includes the same language but in a different place: 15A NCAC 2D. 0530(k). Nearly identical language appears in EPA’s federal PSD regulations at 40 C.F.R. 52.21(r)(4).
- ²⁹ *See supra*, note 15.
- ³⁰ The permit review document for both the original construction permit and the permit to increase VOC emissions contain the following statement: “Public notice is not required for this state-only construction permit under 15A NCAC 02Q .0300.” North Carolina DEQ Air Permit Reviews for Air Permits No. 10203R00 and 10203R04.
- ³¹ 40 CFR Part 51, Subpart I (Requirements for Preparation, Adoption, and Submittal of Implementation Plans—Review of New Sources and Modifications) requires 30 days public notice and opportunity to comment for both minor and major new sources of air pollution. 40 CFR §51.161.
- ³² The Clean Air Act is clear that before a permit can be issued to a major facility like Enviva Hamlet, the state must hold a public hearing. North Carolina, however, believes it is their prerogative whether to hold a hearing, based on whether North Carolina regulators determine that there is sufficient public interest in the proposed permit. Even if this were a valid interpretation, North Carolina still failed to hold a hearing under the state’s own guidelines. North Carolina ignored repeated requests for a hearing, and approximately 300 public comments, showing there was indeed substantial public interest.
- ³³ *See, e.g.* North Carolina DEQ Air Quality Permit for Enviva Hamlet, Permit No. 10365R00 (Mar. 29, 2016) (listing the facility’s address with an incorrect zip code placing the facility some 90 miles east of its intended location). Other errors include public notice documents with no street address or an incorrect street address.
- ³⁴ German Pellets Draft Permit No. 98014, Maximum Allowable Emission Rates table (showing maximum emissions at 579 tons per year based on stack testing at the facility).
- ³⁵ Permit Amendment Application for German Pellets, Prepared by Trinity Consulting (Sep. 2016), § 10.2.2.
- ³⁶ *Id.*, § 11.1.2.
- ³⁷ EPA New Source Review Workshop Manual, Chapter B, § IV.A, at B.11, *available at* <https://www.epa.gov/sites/production/files/2015-07/documents/1990wman.pdf>.
- ³⁸ Title V Issuance Application, Drax Amite, prepared by FC&E Engineering (Aug. 2016), Appendix B: Emissions Calculations.
- ³⁹ *Id.*
- ⁴⁰ *See* Florida DEP Technical Evaluation & Preliminary Determination for Green Circle Bio Energy Permit No. 0630058-014, August 6, 2013, at 5 (referencing the 2010 testing and giving an emission rate of .639 lb/ODT. When

a 10% margin is added to this rate the resulting emission rate is .703 lb/ODT, almost exactly the .704 lb/ODT Drax cited.).

⁴¹ *Id.*

⁴² *Id.* The emission factor of 3.25 lb/ton is back calculated from the reported post-dryer annual VOC emissions (1,344 tons per year) and a production rate of 827,000 tons per year.

⁴³ *See supra*, note 15.

⁴⁴ Mississippi DEQ Statement of Basis for Drax Amite’s Draft Title V Permit (Jun. 20, 2017), at 4.

⁴⁵ Air Emission Test Report for Enviva Wiggins, Prepared by Air Control Techniques (Oct. 31, 2013), at 1.

⁴⁶ *Id.*; State of Mississippi Air Pollution Control Title V Permit No. 2540-00025 (Nov. 30, 2015), at 15.

⁴⁷ Air Emission Test Report for Enviva Amory, Prepared by Air Control Techniques (Oct. 31, 2013), at 1.

⁴⁸ *See, e.g.*, emissions in Table B, note that the emission rates for facilities like Hazlehurst and Drax Amite are after an RTO has removed 95% of HAP emission, which is not the case at Enviva Amory, meaning emissions at Enviva Amory should be much higher.

⁴⁹ Memorandum from Shannon Vogel, NC DEQ Stationary Source Compliance Branch to Robert Fisher, NC DEQ Washington Regional Office and Yuki Puram, Air Quality Permitting Section, Re: Emissions Testing Performed in Amory and Wiggins Mississippi (Oct. 9, 2015).

⁵⁰ *Id.*

⁵¹ State of Mississippi and Federally Enforceable Air Pollution Control Permit for Enviva Amory, Permit No. 1840-00082, Issued May 2, 2007 and Modified April 16, 2008, October 19, 2010, and March 4, 2011.

⁵² *Id.* at 16.

⁵³ Memorandum from Manny Patel, Georgia EPD, to Eric Cornwell, Georgia EPD, entitled “Emission Factors for Wood Pellet Manufacturing” (Jan. 29, 2013).

⁵⁴ State of Mississippi Air Pollution Control Title V Permit No. 1840-00082 for Enviva Amory (Aug. 4, 2015).

⁵⁵ *Id.*

⁵⁶ *See supra*, note 54.

⁵⁷ Because the stack testing report did not include the rate of softwood processed, it is impossible to develop a source-specific emission factor for Enviva Amory. Instead, EIP applied the emission factors from Georgia Biomass, which are widely considered to be the best emission factors for 100% softwood facilities, and applied those emission factors to Enviva Amory’s capacity of 125,000 tons per year. *See supra* note 15. Notably, even if the Georgia Biomass factors give relatively higher-than-actual emission estimates, the facility would still be well above the 250 ton per year threshold.

⁵⁸ 185 tons per year of VOC emissions at 60% softwood and 99,000 tons per year production rate gives an emission factor of 3.73 lb/ODT. Scaling this emission factor to 65% softwood gives an emission factor of 4.04 lb/ODT, which applied to the facility’s current production rate of 121,000 tons per year results in 253 tons per year of VOCs.

⁵⁹ Drax Morehouse operates at 620,000 tons per year and claims to emit 20 tons per year of VOCs, for comparison testing at Enviva Cottondale found 460 tons per year of VOCs when operating at 610,000 tons per year, testing at Georgia Biomass found up to 533 tons per year of VOCs while operating at 820,000 tons per year, and testing at German Pellets Texas reports up to 446 tons per year of VOC emissions when operating at 578,000 tons per year.

⁶⁰ Drax Title V Air Permit Modification Application for Drax Morehouse (Aug. 2016), Section 5.0 Emissions Calculations. Note that when Drax submitted this same testing to Mississippi to support its claims of low VOCs at Drax Amite, they added an asterisk to the pellet cooler testing, labelling it “engineering testing data.” No other portion of Drax’s testing contained such an asterisk, and EIP assumes this is to denote that the pellet cooler testing was not conducted pursuant to any requirement or EPA-methodology.

⁶¹ Louisiana’s Air Permit Briefing Sheet for the November 17, 2017 Title V Air Permit Modification gives 20.95 tons per year of VOCs from the pellet coolers, an identical rate to Drax’s emission factor from their permit application, showing that Louisiana accepted Drax’s emission factor. A December 22, 2017 phone conversation with Steven Schwartz, Louisiana DEQ’s Waste Permits Division (the Division’s officer responsible for reviewing Drax Morehouse’s stack tests), confirmed that the department never received any stack testing data concerning the pellet coolers. Further, Drax Morehouse’s stack testing report only shows PM testing from the pellet coolers, and Louisiana DEQ’s review of these tests also only show PM testing from the pellet coolers. *See* Letter from James Meyers, Engineering Manager, Waste Permits Division, LDEQ to Michael Bellow, Drax Environmental Health & Safety Monitor, RE: Compliance Tests Conducted February 10-24, 2016.

⁶² Louisiana’s Air Permit Briefing Sheet for the November 17, 2017 Title V Air Permit Modification.

⁶³ Assuming the worst-case scenario that the facility-wide emissions are 708 tons per year, and a VOC destruction rate for an RTO of 95%, total emissions from the dryer, hammermills, and pelletizing lines would be 35.4 tons per year.

⁶⁴ Virginia DEQ Stationary Source Permit to Construct and Operate, Registration No. 61653 for Enviva Pellets Southampton (Sep. 5, 2012).

⁶⁵ The exact rate is not available, but applying Georgia Biomass emission factors approximately 900 to 1,000 tons per year of VOCs.

⁶⁶ Letter from Joe Sullivan, Trinity Consultants to Troy Breathwaite, Virginia DEQ, Re: Air Quality Permit Application (May 9, 2013). *See also* Virginia DEQ Stationary Source Permit to Construct and Operate, Registration No. 61653 for Enviva Pellets Southampton (Aug. 15, 2013).

⁶⁷ A thorough review of Virginia DEQ permitting documents related to Enviva Southampton provided by the state in response to an EIP Freedom of Information Act request reveals no discussion of HAP emissions after the switch to hardwoods. The only reference to HAP emissions are found in Enviva's applications.

⁶⁸ Enviva developed a weighted emission factor by scaling HAP emissions based on VOC emissions, as such: "To account for hardwood HAP & TAP [toxic air pollutants] emissions, factors were conservatively calculated by taking the AP-42 HAP factors for 100% softwood (green) and multiplying by the ratio of the total listed VOC emission factors for hardwood and softwood (0.24 / 4.7)." Enviva Pellets Southampton Title V Air Permit Application (Jan. 4, 2016), Table 5 ("Rotary Dryer -HAP and TAP Wood Combustion Emissions"). Under this method, Enviva assumes each HAP is therefore reduced at the same rate total VOCs are reduced. Rather than base all the HAP emission factors for a given hardwood content on the sliding VOC scale, EIP used the ratio between a given HAP in the 100% softwood AP-42 source category and the emission factor for the same HAP in the 40 to 60% source category to create a HAP-specific rate of decrease (AP-42 Table 10.6.2-3 SCC 3-07-006-25 and SCC 3-07-006-26 respectively). This method does not assume that all HAPs are reduced at the same rate, but instead accounts for the unique emission rates of each HAP. For formaldehyde the emission factor at 100% softwood is .14 lb/ODT, and at 50% softwood (e.g. the middle point of the 40 to 60% AP-42 category), the emission factor is .096 lb/ODT. This amounts to a reduction in formaldehyde emissions of 31.43%, whereas total VOCs between the same two source categories are reduced from 4.7 lb/ODT to 1.6 lb/ODT, for a reduction of 65.96%. This shows that formaldehyde emissions do not decrease at the same rate as total VOCs, and instead decrease much more slowly.

⁶⁹ Appling County Wood Pellets, a facility in Georgia, conducted three sets of HAP testing in 2017. In each set of testing, Appling tested at 70% hardwood, 80% hardwood, and 100% hardwood. In two out of three tests, acetaldehyde and formaldehyde increased as hardwood increased. Averages of all three tests revealed emissions of formaldehyde at .85 lb/hour at 70% hardwood and 1.11 lb/hour at 100% hardwood; acetaldehyde at .52 lb/hour at 70% hardwood and .61 lb/hour at 100% hardwood; methanol was emitted at 1.33 lb/hour at both 70% and 100% hardwood. Further, studies of lumber and engineered wood dryers show that during the wood drying process, hardwood emits significantly more methanol than softwood. For instance, one study assessing HAP emissions from oriented strandboard drying showed hardwood emitting nearly three times as much methanol as softwood southern pine, at .33 lb/ODT and .12 lb/ODT respectively. *See* Milota, Michael, "Emissions from Wood Drying: the Science and the Issues," *Forest Products Journal*, 2000, Issue 50(6). Another study of wood drying, conducted at lumber kilns, tested five species of softwood and one species hardwood for HAP emissions, including methanol. The results again showed that the hardwood species emitted much higher rates of methanol than any of the softwoods. *See* Milota, Mike and Mosher, Paul, "Emissions of Hazardous Air Pollutants from Lumber Drying," *Forest Products Journal*, July 2008 Issue 7/8, at 50-55. Notably, the raw data which Enviva relies upon for its methanol emission rate (known as AP-42 emission factors) is based on just three particle board dryers, and EPA gave the data one of the lowest reliability ratings. Enviva relies on the methanol emission factor at AP-42 § 10.6.2, Table 10.6.2-3 SCC 3-07-006-26. Out of the wood-fired rotary dryers tested to develop the methanol AP-42 emission factors, there are only five sources processing any significant amount of hardwood (all of which processed 55% hardwood and 45% softwood pine). Of these five, two are noted to be pre-dryers and have substantially lower emissions than the other dryers, and therefore should not be used to estimate emissions from a full-scale rotary dryer. AP-42's emission factor, however, does not exclude the pre-dryer tests from the average for the emission factor, which means the final emission factor is biased low by these pre-dryer tests. *See* AP-42 § 10.6.2 Data Sets, Rotary Dryer category, Excel spreadsheet available at <https://www3.epa.gov/ttn/chief/ap42/ch10/index.html>.

⁷⁰ AP-42 § 10.6, *see* note 77.

⁷¹ *See* note 77. At 10% softwood the emission factor is .0608 lb/ton. This rate applied to Enviva Southampton's production rate is 16.2 tons per year.

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- ⁷² Enviva estimated the dryer formaldehyde emissions at 5.87 tpy and facility wide HAP emissions at 21.8, while EIP estimates formaldehyde dryer emissions at 16.2 tpy, which pushes facility wide emissions to 31.4 tpy. See Title V Permit Application for Enviva Southampton.
- ⁷³ Appling County Wood Pellets, a facility in Georgia, conducted three sets of HAP testing in 2017. In each set of testing, Appling tested at 70% hardwood, 80% hardwood, and 100% hardwood. EIP averaged all three sets of testing at each softwood ratio, then averaged the emission factor for 80% hardwood and 100% hardwood to estimate emissions at 90% hardwood, which is what Enviva Southampton processes. These emission factors are .08 lb/odt for methanol, .033 lb/odt for acetaldehyde, and .061 lb/odt for formaldehyde.
- ⁷⁴ Florida DEP Draft Statement of Basis for Title V Air Operation Permit Renewal, Permit No. 0630058-020-AV.
- ⁷⁵ Florida DEP Consent Order OCG File No. 17-1134 (Nov. 15, 2017).
- ⁷⁶ Florida DEP Technical Evaluation & Preliminary Determination for Green Circle Bio Energy, Project No. 0630058-014-AC, Aug. 6, 2013 at 4.
- ⁷⁷ South Carolina DHEC, Bureau of Air Quality Construction Permit No. 1240-0133-CB (Jan. 12, 2018); Statement of Basis for Air Permit No. 1240-0133-CB (Jan. 12, 2018).
- ⁷⁸ *Id.*
- ⁷⁹ *Id.*
- ⁸⁰ Custom Stack Analysis, LLC Report on Stack Tests at Colombo Energy, June 19 through July 8, 2017. Colombo submitted this testing to SC DHEC, with the caveat that they were not submitting the June testing in order to meet its source testing obligation.
- ⁸¹ Air Emission Test Report for Colombo Energy, Prepared by John Richards, Ph.D., P.E., Air Control Techniques (Dec. 4, 2017).
- ⁸² Phone conversation between Patrick Anderson, EIP, and Michael Shroup, Manager, SC DHEC Source Evaluation Section (Jan. 25, 2018).
- ⁸³ Alabama DEM Synthetic Minor Operating Permit Nos. 703-0041-X001 through X003 for Lee Energy Solutions, August 12, 2009 (restricting operations to 5,840 hours per year).
- ⁸⁴ *In re: Lee Energy Solutions, LLC*, Alabama Department of Environmental Managements, Consent Order No. 16-023-CAP (Dec. 29, 2015).
- ⁸⁵ Biomass Energy Resource Center, Particulate Matter Emissions-Control Options, 2011, table at 9. Link: http://www.biomasscenter.org/images/stories/FSE_PM_Emissions.pdf
- ⁸⁶ *Id.*
- ⁸⁷ ADEQ Operating Air Permit No. 2341-AOP-R1 for Highland Pellets, LLC (Sep. 15, 2015), at 26.
- ⁸⁸ *Id.*
- ⁸⁹ Arkansas Department of Environmental Quality Air Division Complaint Report, PDS # 23234, Dec. 14, 2017.
- ⁹⁰ *Id.*
- ⁹¹ Ho Kim, Yong et al., “Mutagenicity and Lung Toxicity of Smoldering vs. Flaming Emissions from Various Biomass Fuels: Implications for Health Effects from Wildland Fires,” *Environ Health Perspect.* 126(1):017011 (Jan. 2018); Holder, Amara, at al, EPA Office of Research and Development, PM and VOC Speciation by Combustion Phase (2017).
- ⁹² *Id.*
- ⁹³ For instance, in each case of each of Enviva’s two most recent facilities in North Carolina, Enviva Sampson and Enviva Hamlet, as well as at the Virginia Enviva Southampton plant, Enviva dismissed regenerative thermal oxidizers as “clearly cost prohibitive.” Air Quality Permit Application, Enviva Pellets Southampton, Prepared by Trinity Consultants (May 9, 2013); *see also* Revised PSD Air Quality Construction and Operating Permit Application, Enviva Pellets Sampson, Prepared by Trinity Consulting (Aug. 2014), § 4.4.3.5. (“RTO abatement technology is deemed to be cost prohibitive”); PSD Air Quality Construction and Operating Permit Application, Enviva Pellets Hamlet, Prepared by Trinity Consulting (Jan. 2015), § 4.4.3.5 (“RTO abatement technology is deemed to be cost prohibitive”).
- ⁹⁴ Melin, Staffan, Wood Pellet Association of Canada, Determination of Explosibility of Dust Layers in Pellet Manufacturing Plants (Aug. 30, 2012)(“Dust explosions and fires has become a major issue in the pellets industry as well as in other woodworking industries with devastating consequences in many cases.); Biomass Handling, *Biomass Dust Fire and Explosion Control* (Apr. 24, 2013), at 2 (“Historically, wood pellet production was a small industry with more than its share of fires and explosions. However with the emphasis on green energy, wood pellet production has skyrocketed and very large plants are being constructed. There have been several recent major fires and explosions within the wood pellet manufacturing, shipping, receiving, storage and power plant facilities. These new facilities are learning that they have to employ safe handling practices for dry wood materials.”).

⁹⁵ “2 Burn Victims Remain Hospitalized after Hazlehurst Flash Fire,” WALB (June 4, 2015), <http://www.walb.com/story/28983516/4-seriously-burned-after-fire-at-hazlehurst-wood-pellets>; “Fire Reported at Highland Pellets Plant,” *The Pine Bluff Commercial* (Aug. 16, 2017), <http://www.pbcommercial.com/news/20170816/fire-reported-at-highland-pellets-plant>; “Enviva’s Cottondale Facility Damaged by Fire,” *mypanhandle.com*, (June 11, 2017), <http://www.mypanhandle.com/news/envivas/cottondale-facility-damaged-by-fire/737627383>; Voegele, Erin. “Fire at Enviva Facility Not Expected to Result in Major Downtime.” *Biomass Magazine* (Jan. 9, 2014), <http://biomassmagazine.com/articles/9882/fire-at-enviva-facility-not-expected-to-result-in-major-downtime>; Bryant, Cal. “Enviva Fire Quickly Contained.” *Roanoke-Chowan News-Herald* (Jan. 24, 2013), <http://www.roanoke-chowannewsheald.com/2013/01/24/enviva-fire-quickly-contained/>; Taylor, Stephanie. “Aliceville Plant Closed After Explosion.” *Tuscaloosa News* (Oct. 24, 2016), <http://www.tuscaloosaneews.com/news/20161024/aliceville-plant-closed-after-explosion>; Taylor, Stephanie. “Aliceville Plant Closed After Explosion.” *Tuscaloosa News* (Oct. 24, 2016), <http://www.tuscaloosaneews.com/news/20161024/aliceville-plant-closed-after-explosion>; “German Pellet Plant in Woodville has Fire in Silo.” *Beaumont Enterprise* (Apr. 30, 2014), <http://www.beaumontenterprise.com/jasper/news/article/German-pellet-Plant-in-Woodville-has-fire-in-Silo-5442052.php>; Waldrep, Emily. “Firefighters Respond to Second Fire at Woodville German Pellet Plant.” *Tyler County Booster* (May 07, 2015), <https://www.tylercountybooster.com/index.php/news/1848-firefighters-respond-to-second-fire-at-woodville-german-pellet-plant>; Langford, Cameron. “Residents Go to Court Over Months-Long Texas Plant Fire.” *Courthouse News* (Oct. 27, 2017), <https://www.courthouseneews.com/residents-go-court-months-long-texas-plant-fire/>

⁹⁶ “2 Burn Victims Remain Hospitalized after Hazlehurst Flash Fire,” WALB (June 4, 2015), <http://www.walb.com/story/28983516/4-seriously-burned-after-fire-at-hazlehurst-wood-pellets>.

⁹⁷ Taylor, Stephanie. “Aliceville Plant Closed After Explosion.” *Tuscaloosa News* (Oct, 2016), <http://www.tuscaloosaneews.com/news/20161024/aliceville-plant-closed-after-explosion>

⁹⁸ “Enviva’s Cottondale Facility Damaged by Fire,” *mypanhandle.com* (June 11, 2017), <http://www.mypanhandle.com/news/envivas/cottondale-facility-damaged-by-fire/737627383>; Voegele, Erin. “Fire at Enviva Facility Not Expected to Result in Major Downtime.” *Biomass Magazine* (Jan. 9, 2014), <http://biomassmagazine.com/articles/9882/fire-at-enviva-facility-not-expected-to-result-in-major-downtime>; Bryant, Cal. “Enviva Fire Quickly Contained.” *Roanoke-Chowan News-Herald* (Jan. 24, 2013), <http://www.roanoke-chowannewsheald.com/2013/01/24/enviva-fire-quickly-contained/>; Hill, Brian. “Firefighters Battle Fire at Port of Chesapeake.” *WKTR.com* (Feb. 28, 2018), <http://wtkr.com/2018/02/28/firefighters-battle-blaze-at-port-of-chesapeake/>.

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¹⁰⁴ Clean Air Act section 112(r)(1).

¹⁰⁵ Although the Clean Air Act does not define “extremely hazardous substances,” the legislative history provides criteria which EPA may use to determine if a substance is extremely hazardous. Specifically, the Senate Report states that “extremely hazardous substance” would include any agent “which may or may not be listed or otherwise

identified by any Government agency which may as the result of short-term exposures associated with releases to the air cause death, injury or property damage due to its toxicity, reactivity, flammability, volatility, or corrosivity.” Senate Committee on Environment and Public Works, Clean Air Act Amendments of 1989, Senate Report No. 228, 101st Congress, 1st Session 211 (1989), at 211.