May 27th, 2014

U.S. Department of Energy
Loan Programs Office

Washington, DC

Re: Draft Renewable Energy and Efficient Energy Projects Loan Guarantee Solicitation

Dear Director Davidson:

We are writing to express our concern about the new of the Department of Energy Renewable Energy Loan Guarantee solicitation. We are specifically commenting on Technology Area 3: Waste-to-Energy, which we believe should be eliminated from the solicitation.

Our comments are informed by our extensive work characterizing greenhouse gas and pollutant emissions from the biomass power industry.[1] Based on this work, we are confident that there is not now, nor will there be in the foreseeable future, new scalable technology that burns or gasifies biomass and waste that is deserving of government support as "clean" and climate-friendly.

In this letter, we also draw extensively on a review PFPI conducted of the loan guarantee application of the Taylor Biomass wood and garbage gasification facility (a copy of the report is attached to this letter and is available online[2]). Taylor Biomass describes itself as the "*nation's first, commercial-operation, energy generation facility, powered by syngas produced from the sorted and non-recyclable portions of the waste stream.*"[3] The company applied for a $100 million loan guarantee under the 1703 program during the last round of financing. When we reviewed Taylor's application to DOE, we found significant errors, misstatements, and discrepancies. We discuss the Taylor facility in this letter because we think it is emblematic of the highly speculative and risky nature of technology that has been encouraged by DOE's loan program, and which will continue to be encouraged, unless DOE defines the program to only promote technologies that reduce emissions in reality, as opposed to reducing them on paper.

"Avoid, reduce, sequester" air pollutants and greenhouse gases – relative to what?

The 1703 loan guarantee program is rooted in the Energy Policy Act of 2005, which states:

(a) IN GENERAL.—The Secretary may make guarantees under this section only for projects that—

[1] Our recent report, "Trees, Trash, and Toxics: How Biomass Energy Has Become the New Coal" characterizes how inherent high emissions from burning wood combine with loopholes in the Clean Air Act to make the bioenergy industry highly polluting. http://www.pfpi.net/wp-content/uploads/2014/04/PFPI-Biomass-is-the-New-Coal-April-2-2014.pdf

[2] http://www.pfpi.net/wp-content/uploads/2013/05/PFPI-Gasification-and-DOE-loan-guarantees.pdf

[3] Taylor Biomass application to Department of Energy Title XVII Loan Guarantee Program, Part I. Reference Number: DE-FOA-0000140, Sept. 14, 2009. Page 19.

(1) avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases; and
(2) employ new or significantly improved technologies as compared to commercial technologies in service in the United States at the time the guarantee is issued.

The waste to energy program area is described in the current solicitation as follows:
"This area focuses on projects harnessing waste products such as landfill methane and segregated waste as a source of energy. These types of projects will enable commercial scale utilization of waste materials which are otherwise discarded and produce significant clean, renewable energy. DOE anticipates qualifying projects may include, but are not limited to, the following: methane from landfills or ranches via biodigesters; crop waste to energy and bioproducts; and forestry waste to energy and cofiring."

The science is well-established that burning increases emissions relative to alternate fates of waste and biomass, particularly waste reduction, reuse and recycling. However, the Energy Policy Act of 2005 requires that the technologies promoted under section 1703 reduce and avoid emissions relative to *existing technologies*, not relative to alternate fates of fuels. Therefore, as we explain in more detail below, any expansion of burning of waste and biomass that occurs as a result of DOE's loan guarantee program will increase emissions, although this is clearly contrary to the intent of the program.

Increased biomass burning will increase emissions

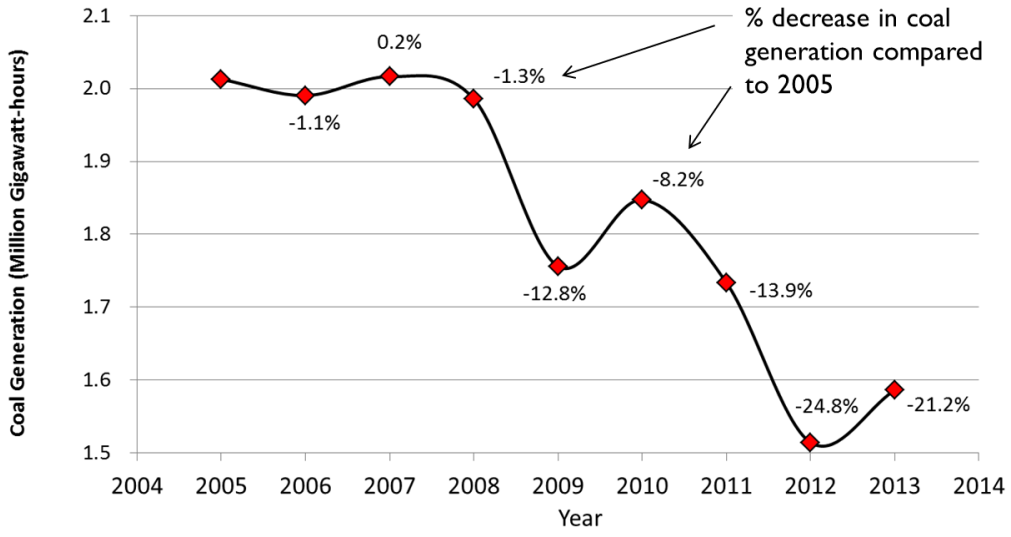
Focusing on DOE's proposal to entertain projects on forestry waste to energy and cofiring, we do not believe any breakthrough is possible that will "avoid or reduce" greenhouse gases compared to existing technologies, given the thermodynamic constraints on bioenergy. Both crop wastes and fuel have been burned as boiler fuel for decades, and despite a variety of approaches attempted, burning these materials emits significantly more CO_2 per unit energy as fossil fuels, and in most cases, more conventional pollution as well. *Lifecycle* CO_2 emissions may be reduced with use of certain fuels, such as short-rotation crop wastes (though recent work indicates soil carbon stocks suffer when residues are removed[4]). However, biomass sourced from "forestry waste" is a significant source of lifecycle greenhouse gas emissions, because forestry wastes left unburned represent carbon storage over years to decades, whereas burning them liquidates that carbon into the atmosphere immediately. Gasifying biomass to produce syngas that can be burned in a combined cycle plant may be marginally more efficient than direct combustion, if the technology can ever be made to reliably work using these feedstocks, but years of promises and trials since at least the 1980's have not yielded a facility that works on an ongoing basis, and our review of the Taylor gasification proposal revealed a large gap between promises and reality.

Further, bioenergy doesn't scale. Even if bioenergy were low carbon, replacing just 10% of our coal use in each year since 2005 would require vastly more wood than is available as "forestry residues" - it would in fact require cutting millions of acres of forest a year,[5] forests that (along with beneficial agricultural activities) EPA estimates are responsible for sequestering 13.5% of our greenhouse gas

[4] Liska, A.J., et al. 2014. Biofuels from crop residue can reduce soil carbon and increase CO_2 emissions. Nature Climate Change, April 20, 2014.
[5] Acres forest cut assumes 80 tons of aboveground biomass yielded per acre.

emissions per year.[6] It is important to note that forests and carbon-sequestering agricultural activities are the *only* carbon sink reported in EPA's inventory of greenhouse gas emissions and sinks. Meanwhile, the following graph shows, coal use has decreased without co-firing.

Replacing 10% of US coal power with wood would require cutting millions of acres of forest each year.



Year	2005	2006	2007	2008	2009	2010	2011	2012	2013
Million tons wood	227	224	227	224	198	208	195	171	179
Million tons CO_2	229	226	229	226	200	210	197	172	180
Acres forest	**2,836,753**	**2,805,239**	**2,841,802**	**2,798,601**	**2,474,606**	**2,603,397**	**2,442,933**	**2,133,749**	**2,235,156**

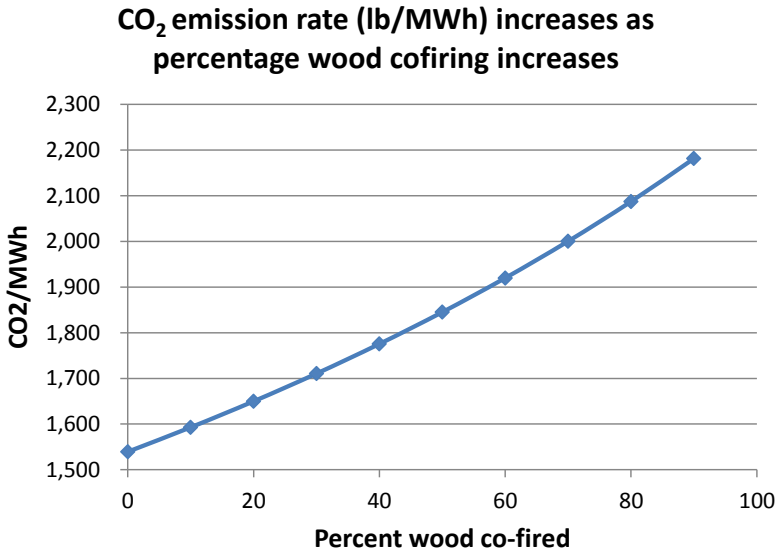
The graph illustrates the futility (and danger) of assuming that wood can ever provide any significant portion of our current energy needs. But in the meantime, while policymakers are caught flatfooted, figuring out the math, bioenergy developers are logging and burning forests in the name of reducing carbon emissions.

To be offering loan guarantees for any technology that accelerates the transfer of carbon from terrestrial stocks to the atmosphere in service of mitigating climate change is a terrible use of taxpayer money. Beyond that, however, DOE's program also seems determined to buck thermodynamics. This is usually a losing battle. Excerpting comments we submitted to EPA on the greenhouse gas new source performance standards for electric utility generating units, regarding biomass co-firing,[7] the following graph illustrates the increase in CO_2 emissions at a coal plant as

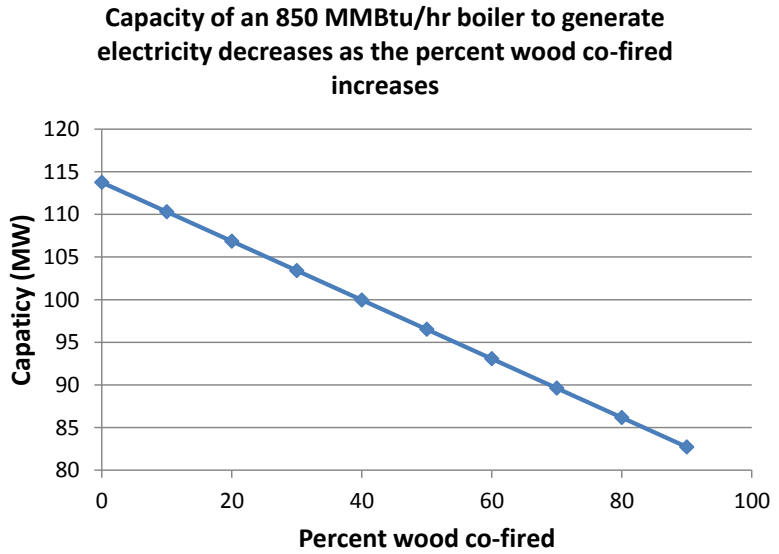
[6] U.S. EPA 40 CFT Parts 60, 70, 71 et al. Standards of Performance for Greenhouse Gas Emissions From New Stationary Sources: Electric Generating Units; Proposed Rule (page 1441)

[7] Comments by PFPI to EPA on "Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generating Units (Proposed Rule) Docket No. EPA-HQ-OAR-2013-0495." Submitted May 9, 2014.

biomass co-firing increases.[8] It is important to note that decreasing plant efficiency with increased co-firing means that coal is burned less efficiently, as well, so that each unit coal burned produces more CO_2 per unit energy.



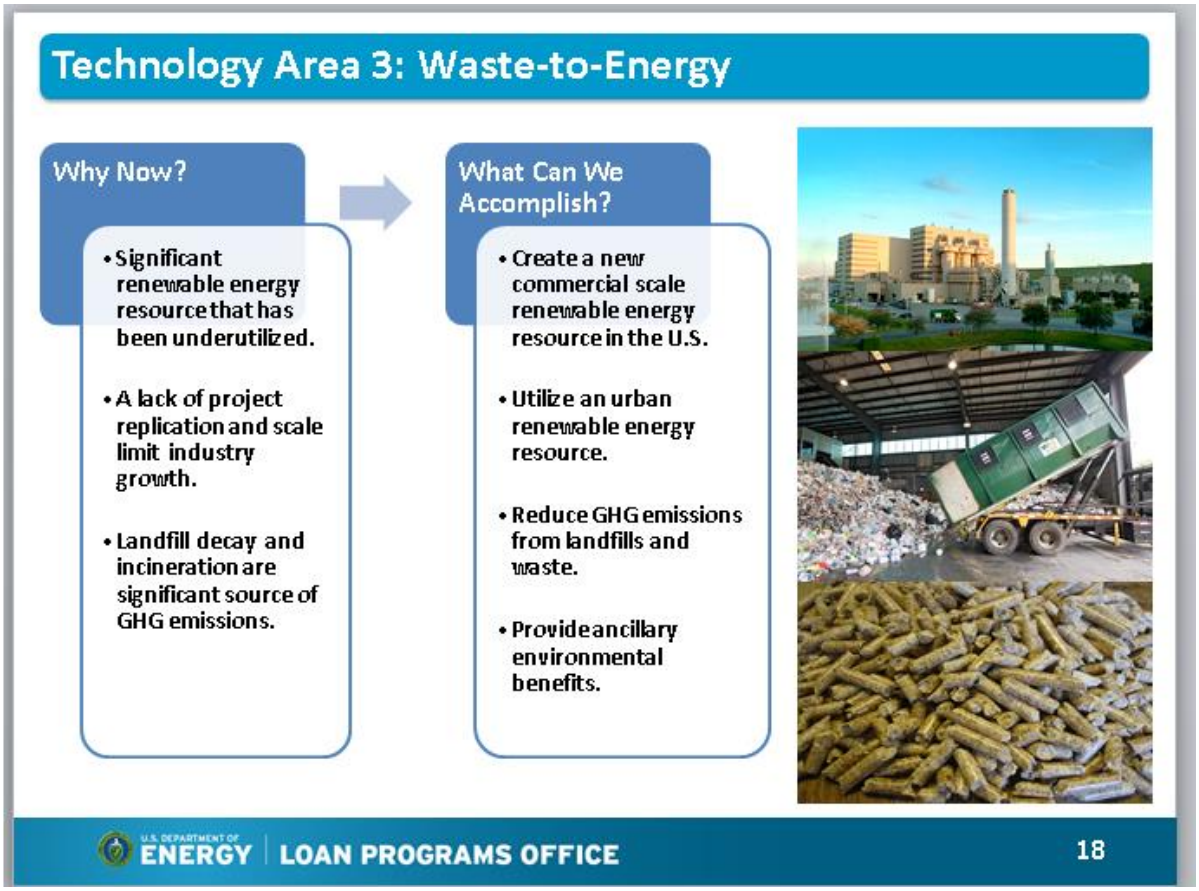
Ultimately, burning wood in a plant significantly decreases its ability to generate electricity. The following graph illustrates the decrease in the capacity of a 850 MMBtu boiler as biomass co-firing increases. Burning coal, a 850 MMBtu boiler can generate around 114 MW; burning wood, it can generate around 83 MW. The degradation in plant efficiency means that more coal needs to be burned to maintain power generation.



[8] The analysis makes the following assumptions: that a coal plant co-firing zero wood has an efficiency of 33%; that a coal plant re-fired with 90% wood (and 10% of the heat input from fossil fuels for startup/shutdown/flame stabilization) has an efficiency of 24%; that efficiency decreases linearly as the percentage of wood co-fired increases; and that burning wood emits 213 lb CO_2 per MMBtu of heat input, while burning coal emits 206 lb/CO_2 per MMBtu of heat input.

Claimed benefits from expanded waste burning are not borne out in reality

With regard to waste incineration, a program supporting efforts to reduce emissions from existing waste burners – putting into action the provision of the Energy Policy Act of 2005 that authorizes 1703 loans for "pollution control equipment"[9] - might be suitable for eligibility as long as there were no net increase in waste combustion planned. However, this is clearly not the case – DOE's briefing on the loan program[10] includes the following slide, which makes it clear that a significant expansion of waste incineration is envisioned:



This slide contains several statements revealing the thinking that underlies DOE's promotion of waste burning. These statements deserve to be addressed.

"Significant renewable energy resource that has been underutilized"

From this, it is clear that DOE envisions a major expansion of waste burning. However, the supposition that waste burning is "renewable" energy is wrong at its core. Garbage is not "renewable." As we found in the analysis of the Taylor Biomass project, the energy value in waste comes from plastics – in fact at that facility, nearly 50% of the heating value in the fuel came from the 20% of fuel that was comprised of plastics. Project documents revealed that without a substantial amount of plastic in the fuel, the Taylor plant would never work thermodynamically. Thus, claims

[9] Energy Policy Act of 2005, Section 1703(b)(9)

[10] At http://energy.gov/lpo/downloads/draft-reee-solicitation-public-meeting-presentation

that the "renewable," biogenic portion of waste can be burned or gasified to yield energy absolutely depend on the presence of non-biogenic, non-renewable, fossil-fuel-derived materials for heat value.

"Landfill decay and incineration are significant source of GHG emissions"
In terms of percentages, landfill decay is not a particularly significant source of GHG emissions, especially as more and more landfills are capturing methane. As we state in the Taylor report, EPA estimates that landfills contribute 16% of United States methane emissions, with a far greater portion (37%) coming from natural gas and petroleum production[11] (this estimate pre-dates new data that show fugitive emissions of methane from natural gas extraction are greater than previously realized).

Importantly, the most current science shows that landfilling waste with gas capture has lower greenhouse gas emissions than combustion for that fraction of waste that cannot be recycled. For instance, a report commissioned by the State of Massachusetts determined that: "*On a per ton MSW basis, modern landfills with efficient gas capture systems reduce two and a half times as much CO_2e as gasification and pyrolysis facilities, and three and a half times as much as waste-to-energy incinerators*."[12] Further, EPA estimates that waste combustion produces emissions of nitrous oxide (N_2O),[13] a greenhouse gas with 310 times the global warming potential of CO_2. It is not clear how much N_2O gasification processes like that proposed at Taylor Biomass emit, but it is unlikely to be zero.

As for incineration facilities, according to EPA, most waste-to-energy facilities in the country already generate electricity,[14] so "incineration" in the absence of electricity generation is not a significant source of greenhouse gas emissions. Would improving the efficiency of electricity-generating mass burn facilities, or replacing existing mass burn facilities with gasifiers, reduce emissions? It might, marginally, although the technology has thus far not been demonstrated to work, and our review of the Taylor facility found that the 33% of material left over after gasification will then be burned in a conventional char burner, with conventional emissions. In any case, even if gasification lived up to the extraordinary promises that have been made about it, any reduction in facility-level emissions associated with exchanging gasification for mass burn would be swamped by the overall increase in waste burning that appears to be DOE's goal.

"Utilize an urban renewable energy source"
As stated above, there is nothing "renewable" about burning garbage. Further, the last thing that urban areas need is more sources of emissions, especially the very toxic emissions associated with burning and gasification of garbage. DOE seems to be out of touch with the environmental justice implications of waste burning facilities. Such facilities are either disproportionately sited in environmental justice communities, or such communities grow up around them, because no one who can afford to live anywhere else will live anywhere near a garbage incinerator. Why should public money be dedicated to building facilities that demonstrably are significant sources of toxic air emissions, including dioxins? The Taylor proposal barely discussed emissions of hazardous air pollutants – it was clear that they had very little if any idea what their emissions would be, and it was

[11] EPA "Greenhouse Gas Emissions" webpage, accessed March 13, 2013, at http://epa.gov/climatechange/ghgemissions/gases/ch4.html.
[12] The Tellus Institute. "Assessment of materials management options for the Massachusetts Solid Waste Master Plan review." Boston, MA. December 2008.
[13] Combustion chapter of EPA WARM documentation available at: http://www.epa.gov/climatechange/waste/downloads/Combustion.pdf
[14] EPA "Waste Reduction Model" documentation – Chapter 10, "Combustion," page 4. At http://epa.gov/epawaste/conserve/tools/warm/SWMGHGreport.html

also clear from the documents we reviewed that DOE was not asking very many questions. Urban areas don't want, or need, their own garbage-based "renewable energy source" that will increase toxic air pollution, and they feel betrayed by policymakers who tell them it's "clean," when it so clearly is not.

"Reduce GHG emissions from landfills and waste"
As stated above, the science does not support the idea that burning waste reduces emissions compared to landfilling, and especially not compared to waste reduction and recycling. Combustion of plastics, upon which waste combustion depends thermodynamically, is especially effective at moving CO_2 into the atmosphere. Chapter 10 (Combustion) of the documentation for EPA's Waste Reduction Model (WARM) makes it clear that combustion increases emissions over landfilling: [15]
"combustion of plastics results in substantial net GHG emissions. This result is primarily because of the high content of non-biomass carbon in plastics. Also, when combustion of plastics results in electricity generation, the utility carbon emissions avoided (due to displaced utility fossil fuel combustion) are much lower than the carbon emission from the combustion of plastics."

"Provide ancillary environmental benefits"
It is difficult to imagine what these "benefits" might be. Environmental benefits are associated with reduction, recycling and reuse of waste, not burning it. That these practices conserve resources, reduce exploitation of new resources, reduce greenhouse gas emissions, and create jobs is well-established. Building new incinerators and large, expensive infrastructure with an ever expanding demand for waste as fuel is directly in opposition to expanded recycling and waste prevention.

Mandated emission levels under DOE's loan program allow too much pollution

The Energy Policy Act of 2005 states that projects receiving loan guarantees under the 1703 program must meet the following standards:

(d) EMISSION LEVELS.—In addition to any other applicable Federal or State emission limitation requirements, a project shall attain at least—
(1) total sulfur dioxide emissions in flue gas from the project that do not exceed 0.05 lb/MMBtu;
(2) a 90-percent removal rate (including any fuel pretreatment) of mercury from the coal-derived gas, and any other fuel, combusted by the project;
(3) total nitrogen oxide emissions in the flue gas from the project that do not exceed 0.08 lb/MMBtu; and
(4) total particulate emissions in the flue gas from the project that do not exceed 0.01 lb/MMBtu.

These minimum standards are achieved or improved up at many existing solid fuel combustion facilities. While the legislation also states that there needs to be a reduction in emissions compared to technologies already in service, our review of the Taylor Biomass proposal found that DOE was simply requiring the facility to meet the minimum standards, not the standards of currently operating facilities. Even so, Taylor Biomass, which repeatedly described itself as "clean," was not able to demonstrate that it would achieve the minimum standards.

[15] EPA modeling treats all biogenic emissions as zero, a nonsensical convention considering that the modeling does count carbon left in landfills as long-term sequestration (if it counts not burning the carbon as sequestration, then clearly burning it liberates the carbon that was sequestered – thus, burning should not be counted as having zero emissions). This means that the true impact of waste burning is actually higher than EPA's modeling shows.

Biomass and waste burning does not provide "clean" energy

DOE often repeats the statement that incineration can provide "clean" energy. By any objective standard, this is not the case. Conventional incineration and even the promised but largely undemonstrated gasification process that the Taylor plant would employ have significant emissions of conventional air pollutants, hazardous air pollutants, and greenhouse gases. Combustion or gasification of low energy, high carbon fuels in low-efficiency facilities means biomass and waste burners inevitably have greater CO_2 emissions per megawatt-hour than fossil fueled plants.

Taylor Biomass also repeatedly used the word "clean" in their application to DOE, yet our review found that:

Char-burning at this small wood/ garbage gasifier would generate more than 40 tons of toxic ash per day

The 24 MW Taylor plant would consume about 400 tons of wood and municipal solid waste a day, and will in turn produce 8,210 lb per hr of char,[16] which is then burned in a separate char combustor to generate more energy. Thus, while gasification proponents are often unhappy with the use of the word "combustion" to describe the technology, in fact, nearly 33% of the feedstock for gasification at Taylor will ultimately be burned in a conventional boiler after the syngas has been collected.[17] Emissions from this char burner would be significant and would not differ from a conventional boiler. Combustion of the char would also produce 3,670 lb of ash per hour (44 tons a day),[18] which contains heavy metals and anything else that isn't burned away. Depending on the concentration of heavy metals and other contaminants, ash may require special disposal as a hazardous waste.

The facility depends on hand-sorting to remove hazardous waste from the fuel stream

Taylor's application states, "*Scale operators will be trained to identify unacceptable wastes during initial inspections. Floor spotters are utilized in recycling and the dumping of waste, and are also trained to look for unauthorized wastes. Sorting personnel and equipment operators will also be trained to identify unacceptable wastes in the processing facilities*."[19] Based on a conversation with the plant developer, the plan is to manually open garbage bags to search for and remove hazardous materials.

DOE's loan process keeps information on hazardous air pollution secret from the public

Waste combustion emits a great deal of pollution. DOE protects developers who want to hide information on pollution emissions from these supposedly "clean" energy projects, even while asking the public to finance them. We used the Freedom of Information Act to request the Taylor Biomass loan guarantee application. When we received the documents we'd requested, all of the information on actual emission from the plant was redacted. DOE's redactions of the Taylor loan application documents even extended to hiding the contaminants present in the fuel; for instance, the application contained the following passage in a section on "volatile metals emissions": "*Hazardous materials such as* [redacted] *are present in the unprocessed feed to the Project.*"

[16] Cornerstone Engineering. Updated engineering report for Taylor Biomass, submitted to NY Dept of Environmental Conservation, March 11, 2009. Appendix P, "Biomass gasification process mass balance".

[17] Cornerstone Engineering. Updated Engineering report for Taylor Biomass, submitted to NY Department of Environmental Conservation, March 11, 2009.

[18] Cornerstone Engineering. Updated engineering report for Taylor Biomass, submitted to NY Dept of Environmental Conservation, March 11, 2009. Appendix P, "Biomass gasification process mass balance".

[19] DOE loan guarantee application Part I, page 94.

When we appealed the redactions, DOE agreed to release the information as long as the company agreed, which naturally they didn't, claiming that "public disclosure of Taylor's 'technical information' would diminish the 'inherent' commercial value of Taylor's technology, thereby harming the company's competitive advantage in the marketplace.[20] DOE could have overridden the company's objection and released the information we requested, but chose not to. In essence, DOE was complicit in hiding from the public the toxic burden that this plant would place on the surrounding community.

Conclusions

Given the variety of technologies that the 2005 Energy Policy Act allows the loan guarantee program to promote – including efficiency, pollution controls, and even "agricultural and forestry practices that store and sequester carbon" – and given the urgency, as shown by the latest report from the Intergovernmental Panel on Climate Change, of reducing emissions *now* – DOE has both authority and motivation to incentivize only those technologies that will actually reduce emissions. This can help to protect the loan guarantee program from criticism, as well. The very construction of the program, which is designed to provide support for projects that have difficulty obtaining conventional financing, increases the possibility that DOE will be left holding the bag on a failed project. The biomass and waste burning industry archives are strewn with big-infrastructure, complicated, expensive, and failed projects. DOE has been close to financing projects with just this potential (for instance, the Taylor Biomass plant got a "ccc" rating from Standard and Poor's due to its speculative and risky technology). By eliminating incentives for combustion-based technologies from the loan guarantee program, DOE can eliminate the double jeopardy of such financial risk, alone with environmental and public health risk from DOE-supported energy projects.

Thank you for your consideration of these comments.

Mary Booth
Director, Partnership for Policy Integrity

Laura Haight
Senior Environmental Associate, New York Public Interest Research Group

Barbara Warren
Executive Director, Citizens' Environmental Coalition

[20] Letter to PFPI from DOE, May 16, 2013.