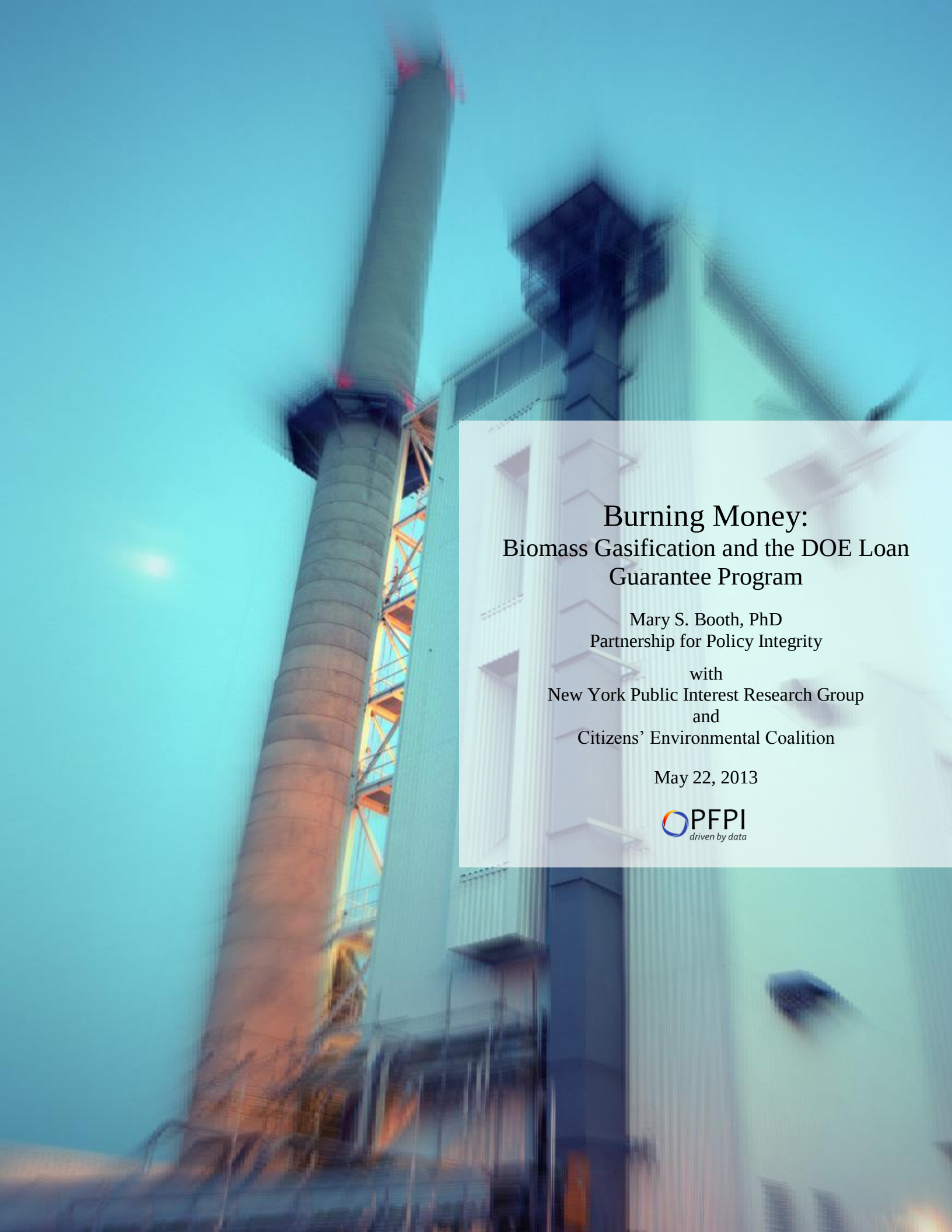

Burning Money:
Biomass Gasification and the DOE Loan Guarantee Program

Mary S. Booth, PhD
Partnership for Policy Integrity

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New York Public Interest Research Group
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May 22, 2013

PFPI
driven by data

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Cover Photo: Gasification unit at McNeil plant in Burlington, Vermont. Credit: Warren Gretz, National Renewable Energy Laboratory.

Executive Summary

A detailed review of more than 3,000 pages of previously undisclosed documents from the U.S. Department of Energy (DOE) reveals that the highly touted "green" Taylor Biomass gasification project in Montgomery, New York will have air pollution limits no better than a conventional garbage incinerator. According to the documents, the Taylor plant is based on highly speculative, unproven technology and received a "ccc" credit rating from the prestigious Standard and Poor's, which characterized the project as "a significant credit risk," "currently vulnerable to nonpayment, and dependent on favorable business, financial and economic conditions to meet its obligations."

The owners of Taylor claim that the plant uses a new, innovative, integrated garbage gasification and combined cycle process that is so clean that it should qualify for $100 million in taxpayer-backed loan guarantees from DOE typically reserved for cutting edge renewable energy projects, as well as $33 million in federal cash grants. But the documents, many of which were submitted to the Department of Energy by Taylor or its contractors, and were obtained under the Freedom of Information Act by PFPI, fundamentally undermine this claim.

Taylor positions itself as a clean technology that will burn gas derived from garbage, wood, and construction and demolition waste, yet one-third of the material by weight is left behind after gasification and will be burned in a conventional incinerator on the site. The air pollution levels set in the Taylor air permit for particulate matter, sulfur dioxide, and mercury all exceed the DOE limits to qualify for renewable energy loan guarantees. On this basis alone, Taylor should be denied federal taxpayer–funded support.

The DOE loan guarantees are reserved for "innovative" projects. Taylor Biomass claims it is innovative because it will gasify garbage, but it depends on workers to hand sort 1,400 tons per day of waste wood, demolition debris and municipal garbage as the central means of removing hazardous materials from the fuel stream. This sorting "technology" is unproven in practice, but common sense dictates that it will be less than 100 percent effective. Taylor claims that their emissions will be clean, but data on fuel contamination show that even small amounts of pressure-treated wood in the fuel stream can increase emissions of heavy metals and other air toxins considerably.

While the company has variously presented the Taylor plant as using only organic materials as fuel, or as using only small amounts of plastic, an independent report based on the company's own test burns concludes that the plant will rely on plastics for nearly half of the total energy in its fuel stream.

The plant's air pollution permit from the state accommodates this toxic fuel stream by adopting weak hazardous air pollution limits for the plant, ironically, those for a municipal waste incinerator, instead of much tougher standards that apply to industrial waste burners. Under the terms of the air permit, the facility will be allowed to emit 10 times more lead, 7 times more cadmium, and 12 times more mercury than it would if it were permitted as an industrial waste burner. The plant will also emit dioxins and volatile organics like benzene.

Notably, Taylor Biomass has taken aggressive action to block public access to data on fuel contamination and projected pollution emissions at the plant. In documents provided to PFPI by DOE, fuel contaminant and emissions data were heavily redacted at the request of Taylor Biomass, on the grounds that disclosing the data would cause "substantial harm to the applicant's competitive position." DOE could have overridden this argument, but did not.

Achieving specified pollution rates is a requirement for receiving a federal loan guarantee. Given the fact that Taylor's permitted air emission levels exceed DOE's required rates for key pollutants, real emissions data would be the best way for Taylor to prove that it indeed does comply with DOE pollution requirements. Instead, Taylor has actively blocked all public access to these data and made it impossible for anyone outside the company or DOE to evaluate whether or not the plant will comply with the relevant pollution specifications.

DOE's acquiescence to Taylor's secrecy strategy and rationale is no better, and prompts serious questions about the transparency of the vetting process at DOE.

In addition to all this, the Taylor plant is a bigger climate polluter than equal sized natural gas facilities. The Department of Energy requires applicants for loan guarantees to show how their project will "avoid, reduce, or sequester" greenhouse gas emissions. Taylor Biomass makes a series of extravagant claims in their application as to how they will achieve this goal, none of which are substantiated with data.

Gasifying and burning the combination of wood and garbage Taylor proposes to use as fuel will emit at least 1,670 lbs of carbon dioxide per megawatt hour of electricity generated, twice the carbon dioxide of a combined cycle natural gas plant. The plant will have greater greenhouse gas emissions than landfilling waste with gas capture. While it is true that someday carbon dioxide from some of the wood burned in the plant might be resequestered in the trees of some unspecified forest, that notion is hardly sufficient to nullify the substantial and measurable carbon emissions coming from Taylor's stacks every day.

In sum, Taylor Biomass is permitted to emit as much pollution as a conventional trash incinerator, with limits that exceed DOE requirements for projects receiving loan guarantees. It is based on unproven technology, and has received a poor bond rating of "ccc", indicating it is an extremely high-risk investment. Its fuel will include plastics, synthetics, and other toxic trash, and its smokestacks will emit hazardous compounds, heavy metals, and conventional air pollutants. On top of all that, it is a bigger climate polluter than similar sized natural gas burning power plants. We stand with the many who support government funding that helps develop truly clean energy technologies, but this project fails to meet a number of DOE criteria for innovative and clean projects, and should be denied a loan guarantee under the 1703 program.

The ever-moving goal posts of biomass and waste gasification

Gasification of biomass and waste has long been the grail for the biomass industry, promising since the 1980's and before to generate "clean", "low-emissions", and "carbon neutral" energy from fuels as diverse as municipal solid waste (MSW), shredded tires, wood chips and bark, agricultural wastes, chicken waste, switchgrass, and shredded automobile residue.[1] However, while coal gasification is an established technology, commercialization of large-scale biomass gasification has not been achieved in the United States, despite having been extensively supported with federal research and financing for a number of years. The lack of successfully commercialized projects notwithstanding, the promise of waste gasification continues to attract believers. The latest to succumb to the promise was the State of Massachusetts, which in May 2013 lifted a more than 20-year ban on new garbage incinerators in the state to allow development of waste gasification facilities.

The federal government continues to support development of gasification technology as well. Currently, the Department of Energy (DOE) is considering granting a loan guarantee to the 24 MW Taylor Biomass "integrated gasification and combined cycle" (IGCC) project proposed in Montgomery, NY. In 2009, Taylor applied for a $100 million loan guarantee under DOE's "1703" program, which is designed to provide guarantees to projects that "*use new or significantly improved technologies as compared with commercial technologies already in service*"[2] that "*avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases*."[3] DOE's program focuses on "*innovative clean energy technologies that are typically unable to obtain conventional private financing due to high technology risks*."[4] Taylor Biomass has also applied for a federal Department of Treasury cash grant that will reimburse 30% of construction costs, for a total of about $33 million.

Fallout after the Solyndra failure may have made DOE cautious about granting new loan guarantees. While stories in the press reported that Taylor had been selected as recipient of a loan guarantee in 2011,[5] the agency had not as of February 2013 approved any projects under the 1703 program[6] and appears to still be in the "due diligence" phase of evaluating several projects, including the Taylor plant.[7] Meanwhile, Taylor has lobbied extensively[8] and made their case in the press and with policymakers that their technology is truly clean and low-emissions.

Taylor 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.*"[9] The facility proposes what is supposed to be the state-of-the-art technology for gasification, and is further along in its development than other gasification facilities that have been proposed. The Partnership for Policy Integrity thus decided to evaluate the DOE loan guarantee application of the Taylor project as a way to investigate emissions by gasification projects in general, and to determine whether the Taylor facility in particular could meet DOE criteria for innovative, clean projects. We requested access from DOE to Taylor's loan guarantee application using the Freedom of Information Act (FOIA), specifically requesting information on emissions of greenhouse gases and other pollutants from the facility. Our FOIA yielded over 3,000 pages of documents from DOE, which we reviewed.

Even given the volume of the material we received, however, it was not easy to determine what the emissions of the Taylor facility would be, because DOE redacted much of the very

information that we were seeking on the basis of the agency's "(b)(4)" rule, protection of proprietary/commercial information. For instance, the following table should contain information on emissions that we requested, but was almost completely redacted.

1.3 Emissions at prodution site (for air emissions, refer to emission list in Section 3 below)

Air Emissions (Expand as necessary*	lb/MW product
Greenhouse Gases	
1. CO2	(b) (4)
2. CO	
3. CH4	
4. N2O	
5. Other - specify	
Other Air Emissions	
6. PM 10	
7. PM 2.5	
8. SO2	
9. NOx	
10. Mercury	
11. Other - specify	
VOC	
HAPs	

Water Emissions (Expand as necessary) (e.g., Effluent for Crop Irrigation, Cooling Tower Evaporation/Drift)		lb/MW product
1. Total water discharge		(b) (4)
2.		
3.		
4.		
5.		
6.		

Solid Wastes * (Expand as necessary)		lb/MW product
1. Municipal		(b) (4)
2. Hazardous		
3. Combined Wet Solid Emissions for Soil Amendment		
4. Other - specify	ash	

Table 1. Page of redacted information from Taylor Biomass DOE loan guarantee application.

The redactions 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* (b)(4) *are present in the unprocessed feed to the Project*."

We appealed the redactions of emissions data to DOE on the grounds that if DOE makes achieving certain emission rates a requirement for receiving a loan guarantee, this information should be transparent, as the public has the right to know how much pollution will be emitted by a plant that is backed and supported with public funds. DOE agreed to release the previously redacted information on the grounds that it was not integral to the company's proprietary technology. However, DOE still had to submit the un-redacted information to Taylor Biomass for approval, which the company did not give. DOE accepted the company's rejection and, as allowed by law, presented us with new justifications for withholding the information. DOE now claims that it cannot disclose information about emissions because 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.[10] DOE could have overridden the company's objection and released the information we requested, but chose not to.

We don't agree that disclosing information on pollution emissions, which is required by DOE to determine whether a facility is "clean" enough to deserve taxpayer support, would harm the facility's competitive position. Despite the redactions, however, we were still able to discover much useful information in the documents. This report summarizes our findings; we also submitted a letter to the DOE, which is included at the end of this report.

The Taylor Biomass project

The Taylor Biomass facility is proposed as a 24 MW unit in Montgomery, NY, that will gasify municipal solid waste (MSW), construction and demolition waste (C&D), and other waste wood, consuming about 31,250 pounds of material per hour.[11] The project has had trouble attracting development financing because the gasification technology it will employ is still in the development stage. Therefore, the company has applied to the DOE loan guarantee program, which would guarantee creditors would be repaid with public money should the project default. Taylor has also applied to the Department of Treasury's "1603" program, which converts a renewable energy investment tax credit worth 30% of a project's construction costs to a cash grant.[12] Taylor estimated the value of the grant to be $33,308,961 in their 2009 loan guarantee application,[13] where it is clear that the receipt of this money is critical to the financing of the project. (Currently, however, grants allocated under the 1603 program appear to be subject to an 8.7% cut under the sequester,[14] meaning the Taylor grant could be reduced if it is allocated).

The financial viability of the Taylor gasification enterprise is revealed by some of the very assessments that DOE requires for the loan guarantee evaluation process, including a credit risk assessment by Standard and Poor's. The S&P report was not good news for the project, listing only four strengths, but eight weaknesses, and ultimately giving the project a "ccc" rating meaning that it is "*currently vulnerable and dependent on favorable business, financial and economic conditions to meet financial commitments.*"[15] The report observed that Taylor's power purchase agreement compels the plant to generate more energy each year, with a requirement that the plant be available 85% of the time in year 3, and 92% of the time in years 4 and 5. The report states, "*given the technology, this availability requirement is a significant credit risk*", although it also observes that the plant does have the option of burning natural gas to ensure that power generation is uninterrupted.

Figure 1. Biomass gasifier in Paia, Maui, Hawaii. This facility operated for a time in the 1990's and used sugarcane bagasse as fuel. Photo credit: Richard Bain, National Renewable Energy Laboratory.

While coal gasification plants exist in the United States, there are no operating large-scale gasifiers that use wood or garbage as fuel. There have been a couple of "pilot" projects, for instance, a gasifier that used sugar cane processing waste (bagasse) in Hawaii as fuel operated in 1996 – 1997, and a wood gasification unit at the McNeil biomass facility in Vermont was tested for about 1,000 hours between 1999 - 2001.[16] While various small gasifiers exist, these are not large-scale combined cycle units like the Taylor facility.

The S&P report notes that there are no biomass base IGCC units online in the United States, and "*there is not yet sufficient data to support biomass integrated gasification combined cycle as a proven*

technology". It observes that of the existing coal gasifiers in the United States, none have achieved 85% availability. The report states that on a per kilowatt comparative basis, the Taylor facility "*is more expensive than coal and natural gas power plants, and even more expensive than the Wabash and Polk (coal gasification) facilities*".

On the plus side for the proposal, the report notes that the Taylor project "*essentially has negative fuel cost in that it receives tipping fees to accept the fuel for the facility*." Tipping fees are indeed projected to be a major source of revenue for the plant; in their loan application, Taylor shows that tipping fees for MSW range from $50/ton to over $80/ton, and a 2008 IRS evaluation of the facility's eligibility for tax credits reports that Taylor then anticipated receiving $50 for each ton of MSW it received,[17] a rate that has probably increased since then.

However, a trash incinerator that is not allowed to burn trash will not be able to generate tipping fees from garbage disposal, and that happens to be the case with the Taylor facility, at least initially. The S&P evaluators, and probably DOE as well, were unaware that the Taylor facility's as-yet-unissued state air permit would not initially allow use of MSW as fuel, and perhaps never will, if emissions exceed permitted standards. Item 85.4 of the state air permit states the main facility process to be a

> *"Combustion turbine and process combustor operating on* ***clean wood only****. Clean wood means untreated wood or untreated wood products including clean untreated lumber, tree stumps (whole or chipped), and tree limbs (whole or chipped). Clean wood does not include yard waste or construction, renovation and demolition wastes."*[18] (emphasis added)

According to the NY Department of Environmental Conservation, which issued the air permit, the facility will begin operation using only clean wood, then after six months they will conduct emissions testing. They would then introduce MSW into the process, and within 18 months, they will conduct another round of emissions testing.[19] It is not certain the facility will ever be allowed to use garbage as fuel, as this depends on the outcome of the emissions tests. Since the S&P credit assessment notes that tipping fees are an important income stream with which Taylor would repay its loans, any uncertainty about whether the plant will be able to burn waste at all should make creditors nervous, including the taxpayers who will ultimately back the plant if the loan guarantee is approved.

Besides generating tipping fee revenue, Taylor's use of garbage as fuel is also integral to the idea of the project as "innovative" and thus deserving of a DOE loan guarantee:

> *"The Taylor Biomass Energy Solution is a proprietary, innovative and customizable system that will accept MSW and C&D as a raw energy source, separate out and recycle the small portion of the waste material not suitable for energy production, produce a stable, cost effective biomass feed stock from the remainder, and use the feed stock to fuel its proprietary gasification process, which produces steam power and a relatively clean MCV product gas that can directly substitute for natural gas in industrial process equipment. The steam and product gas can then power a combined cycle electric power generation facility.*

> *This system replaces the current MSW and C&D disposal process (landfills and incinerators) with an environmentally friendly process that also generates clean, renewable supplies of energy at a competitive price while essentially eliminating the production of greenhouse gasses."*[20]

The restriction on actually using waste as fuel is thus a significant roadblock for the facility to be considered "innovative" under its own terms.

Gasification – incineration by any other name

The gasification process at Taylor Biomass will consist of heating fuels – as proposed by Taylor, forest wood, construction and demolition (C&D) wood, and municipal solid waste (MSW) – but depriving the process of oxygen, which causes volatile gases to be driven out of the material. This "syngas" is collected, cleaned to reduce tar content, then burned in a combustion turbine, which spins, generating electricity.[21] Waste heat from this combustion is used to generate steam, which drives a second turbine. This "combined cycle" technology makes the facility more efficient than the single-cycle technology used at traditional biomass power plants.

From the standpoint of the fuel, the process of driving off volatile gases from wood and MSW is known as "pyrolysis," and the pyrolyzed material left over after gasification is commonly known as "char." The 24 MW Taylor plant will consume about 400 tons of wood and MSW a day, and will in turn produce 8,210 lb per hr of char,[22] 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.[23] Combustion of the char in turn produces air emissions as well as 3,670 lb of ash per hour (44 tons a day),[24] 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 physical plant of a gasification facility is not unlike a traditional incinerator. At Taylor, emissions from the combustion turbine and the char burner will be vented out a common stack that will be 90 feet tall and 7 feet in diameter.[25] Additionally, a 90 foot-tall "emergency flare" will operate for up to 100 hrs per year[26] to burn off syngas at times when the combustion turbine is not operating.[27] A third stack (45 feet in height) will vent emissions from the startup boiler, which will burn natural gas.[28] At 105 feet,[29] the gasification unit itself will exceed the height of the emission stacks on the property.

Garbage in, air toxics out

Although often referred to as "clean," gasification is not a magic technology that makes air pollution and toxics disappear. Reducing the amount of toxics emitted at the stack greatly depends on making sure they don't get burned in the first place. The facility claims it won't burn hazardous materials, and will use a combination of hand-sorting and optical sorting equipment to ensure that "*in-organics and household hazardous waste (HHW), painted or treated wood, metals, glass, asphalt, brick, gypsum, dirt and fines, concrete electronics, and other materials that are not appropriate biomass*"[30] are removed before the material is used as fuel.

In reality, Taylor will rely heavily on employees to spot hazardous materials and remove them before they enter the fuel stream. The 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*."[31] However, Taylor is expanding the facility's recycling stream, as well as generating fuel for the gasifier, thus they will dramatically expand the volume of waste requiring inspection. While the plant will use about 400 tons per day (TPD) of waste as fuel, the application states the project "*will expand from its current capacity of 307 TPD of C&D waste and 100 TPD of wood waste, to accommodate a new inflow of 450 TPD of C&D waste, 100 TPD of wood waste, and 500 TPD of municipal solid waste*."[32] This is a total of 1,457 TPD of material – much of it contained in garbage bags – that will require scrutiny for hazardous materials.

The power is in the plastics

Like conventional incineration, gasification can only generate energy based on the energy inherent in the fuels it uses. Although advertised as a biomass power plant, Taylor's ability to function as promised and generate energy from MSW appears to depend on burning plastics and other synthetics derived from fossil fuels, because these materials are more energy rich fuel than organics. Test data bear this out. In Taylor's experimental burns of pelletized garbage at a small gasifier, the 20% of the material that consisted of plastics, Styrofoam and other synthetics had more than three times the heating value of the other material, and provided 46% of the energy in the fuel.[33] Removing this material from the fuel would dramatically decrease its energy content.

Taylor's documents make it clear that plastics and other synthetics will be used as fuel. Describing the sorting process for recycling construction and demolition (C&D) waste, Taylor's engineering report states, "*the lighter density fraction (assumed to be comprised of plastics and various unacceptable materials) … will be captured… and transported to a trash compactor. Then compacted… then transferred to the Biomass Processing Building to become an acceptable portion of the Processed Biomass Fuel*".[34] In other words, the synthetic materials that are unacceptable for recycling, once compacted, become "acceptable" biomass fuel. Ultimately, the "Processed Biomass Fuel" generated following materials separation is "*anticipated to include items such as paper, food, wood (excluding pressure treated and painted), fiber, leather, textiles, and select plastics*."[35]

Information on the fuel composition is found in the 900-page engineering report, but the actual loan guarantee application submitted by Taylor seems to downplay the amount of plastics the facility would burn, stating that the facility's design and process "*converts the organic biomass portion of mixed solid waste to energy*"[36] and that "small" quantities of plastics and other similar materials "may also" be used as input[37] to the gasifier. A 2008 memo from the Internal Revenue Service, which weighed in on the facility's eligibility to receive renewable energy tax credits, indicates that Taylor had informed them that *only* organics would be used as fuel:

> "*the facts as represented by Taxpayer and Taxpayer's representatives are as follows… The material that makes it through sorting to fuel the Plant* ***will be 100 percent organic in terms of Btu content***" [38] (emphasis added).

Since the most recent documents on the facility clearly show that a significant portion of the fuel will not be organic, the IRS eligibility determination should be revisited to determine whether the facility still qualifies under new IRS rules.

Gasification greenhouse gas emissions – more than fossil fuels

The Department of Energy requires applicants for loan guarantees to show how their project will "avoid, reduce, or sequester" greenhouse gas emissions.[39] Taylor Biomass makes a series of claims regarding greenhouse gas emissions in their application, none of which are substantiated by data. They start with methane:

> *"Over 75% of the methane emissions in the environment originate from MSW decomposition in landfills. By converting the organic material into sustainable energy, these emissions can be virtually eliminated*."[40]

This is not the case. In fact, EPA estimates that landfills contribute 16% of United States methane emissions, with a far greater portion (37%) coming from natural gas and petroleum production[41] (this estimate pre-dates new data that show fugitive emissions of methane from natural gas extraction are greater than previously realized). The most current science shows that landfilling 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*."[42] Further, EPA estimates that waste combustion produces emissions of nitrous oxide (N_2O),[43] a greenhouse gas with 310 times the global warming potential of CO_2. It is not clear how much N_2O the Taylor process will emit, but it is unlikely to be zero.

Taylor's application goes on to state:

> *"Since the post-sorted biomass from C&D and MSW residuals is a sustainable biomass source, the net CO_2 emissions from the overall process (as with other biomass systems), is near zero."* [44]

This claim is equally insupportable. There's nothing "sustainable" about burning garbage, particularly when a large portion of the heating value in the fuel is derived from plastics and other synthetics of fossil fuel origin. As EPA documentation[45] points out, "*combustion of plastics results in substantial net GHG emissions. This result is primarily because of the high content of non-biomass carbon in plastics*." The claim that emissions are "net zero" is therefore unjustified.

Even more importantly, and despite what bioenergy advocates claim, there is no getting around the fact that burning wood and garbage emits more CO_2 per unit energy generated than burning fossil fuels. Each day, the facility will instantly transform nearly 100% of the carbon held in 400 tons of materials to atmospheric CO_2. Taylor will use combined cycle technology and will be more efficient than a traditional combustion facility that uses a single steam-driven turbine, meaning its emissions per unit energy will be reduced somewhat. Nonetheless, Taylor's stated emission rate of 1,670 pounds CO_2 per megawatt-hour (lb/MWh)[46] is about twice the emissions rate of a combined cycle natural gas plant. This value considers Taylor's gross power production, which will be 24 MW, but calculating emissions based on net power production of 20 MW (gross production minus what the plant consumes for its own operation, known as parasitic load) yields emissions of 2,004 lb/MWh.

Gasification's black box of pollutant emissions

DOE's requirement that loan guarantee recipients use "innovative clean energy technologies" and "avoid, reduce or sequester air pollutants" are enforced by the requirement that facilities meet emissions restrictions for the "conventional" pollutants nitrogen oxides (NO_x) sulfur dioxide (SO_2) and particulate matter (PM), as well as mercury. However, portions of the waste stream that are incinerated because they cannot be reused or recycled can emit very toxic substances, like dioxins, heavy metals, and carcinogens like benzene and formaldehyde. DOE does not appear to impose limitations on some of the most toxic pollutants that waste gasification and char incineration could produce.

Taylor's application to the DOE hardly even mentions these potential toxic emissions, and in fact appears to have reported zero emissions of hazardous air pollutants (HAPs) in their application to DOE (Table 1). However, in its application for the state air permit, the company had to estimate emissions of air toxics. There, rather than reporting actual emissions data from the gasifier where Taylor tested their technology, Taylor used standard EPA emission factors for natural gas to estimate air toxics from the combustion turbine, and standard emission factors for wood-fired boilers to estimate emissions from the char burner. As the facility will gasify and burn garbage and construction and demolition waste, including plastics and other synthetics like carpet, the EPA emissions factors for natural gas and clean wood very likely underestimate the toxics that will be emitted by the Taylor facility.

According to Taylor's air permit application, the combustion turbine will emit "*unburned hydrocarbons, 20% of which are assumed to fall within the category of volatile organic carbons,*"[47] a class of pollutants that includes carcinogens like benzene and formaldehyde. The engineering report prepared for the Taylor facility includes the following as a risk and its mitigation:

> "*Condensable organics will be polyaromatics and are therefore suspect carcinogens. The gas conditioning reactor will destroy 90% of these materials. The remainder will be removed by scrubbing and disposed of within the process combustor or by treatment of the process waste water stream*."[48]

Given that the Taylor gasification process has never been tested at scale, and given that the facility has chosen to estimate emissions rather than reporting emissions data from a test facility, the assurance that these carcinogens will be eliminated is little more than speculation. While the air permit does require testing for certain toxic emissions, this testing will occur one time only, within 180 days of when the facility starts using MSW as fuel.[49]

Arsenic, chromium, lead, and mercury
Taylor plans to rely on visual identification to remove many hazardous materials from the fuel stream. Where the application identifies "*MSW contaminants causing environmental concern*" as a risk, it proposes as mitigation, "*removal of pressure treated and painted wood is monitored and controlled to eliminate those materials from the biomass stream*".[50]

Removing pressure-treated wood is important, because the chemical cocktail used to pressure-treat lumber contains chromium and arsenic, two highly toxic substances. However, manual sorting will not remove all painted and treated wood from the 757 tons of C&D materials that will arrive at the Taylor facility each day. To demonstrate the difference in heavy metals content between untreated wood and demolition waste that contains small amounts of pressure-treated wood, PFPI retrieved data on the metals content of "unadulterated" wood from a recent EPA database[51] of fuel contaminant values that was assembled for the "boiler rule" rulemaking, and compared these data with a study on metals content in samples of construction and demolition (C&D) wood that was conducted in Massachusetts.[52] The unadulterated wood data included samples that had been tested for chromium (99 samples) and arsenic (55 samples), ingredients of the copper-chromium-arsenate (CCA) cocktail that has long been used as a pressure-treatment wood preservative, but which should be present only at low concentrations in unadulterated wood. We also retrieved data on lead (67 samples), which could be found in some painted demolition wood but should also be found at relatively low concentrations in untreated wood.

The C&D analysis study contained data on weight percentage of each sample of wood chips that was comprised of CCA-treated wood, reporting a range of 0.8% to 6.1% in 15 composite samples that were collected after demolition wood was chipped. The ranges and averages of metals concentrations in those samples, in parts per million (ppm), were as follows, with the lowest values for metals found in the samples with the lowest amount of C&D wood:

	Chromium	Arsenic	Lead
Range of metals content from fuel analysis study (ppm)	8.4 - 185	6.9 - 165	6.8 - 148
Average of metals content from fuel analysis study (ppm)	81.6	72.6	51.4
Range of metals for "unadulterated" wood in EPA data (ppm)	0.1 - 72.7	0.12 - 68.36	0.1 - 106
Average of metals for "unadulterated" wood in EPA data (ppm)	3.13	1.24	1.58

Table 2. Ranges and averages for metals concentrations in samples of construction and demolition wood collected for a fuel study in Massachusetts, and EPA data on "unadulterated" wood fuel samples from a variety of facilities.

The take-home message from these data is that even when wood chip fuel contains relatively small amounts of CCA-treated wood, this significantly boosts the content of heavy metals over what is found in unadulterated wood, even when the set of unadulterated wood samples contains some relatively high values. No matter what is claimed, it is impossible for Taylor Biomass to

remove 100% of pressure-treated wood from the fuel stream, to say nothing of the metals and other toxics that enter the fuel stream from MSW. It is therefore not appropriate for them to use EPA factors that are derived from clean wood to estimate their emissions of heavy metals and other hazardous air pollutants from the char burner, because to do so underestimates actual emissions. Leaving blank the part of the table where they are supposed to report to DOE how much hazardous air pollutants (HAPs) that they will emit, as they appear to have done in their loan guarantee application (Table 1), is a significant omission.

A pass to pollute

Taylor repeatedly uses the word "clean" in their DOE application to describe the gasification process. Whatever the language used, however, setting low emission limits in the state air permit is the only *enforceable* way to ensure that the facility's emissions are controlled to certain levels. In writing the air permit, the company could have worked with the New York State Department of Environmental Conservation (DEC) to set the lowest emission rates that could be achieved using pollution control technology. Unfortunately, it appears that the decision was made to write the permit using EPA's standards for conventional municipal waste combustors (MWC),[53] which allow for a significant amount of pollution to be emitted.[54]

MWC limits for new large units		CISWI limit for new biomass ERU's burning solids		Taylor Biomass air permit limit		Taylor/CISWI limits ratio
Hydrogen chloride (ppmv)	25	Hydrogen chloride (ppmv)	0.2	Hydrogen chloride (ppmv)	25	125.0
Lead (µg/dscm)	140	Lead (mg/dscm)	0.014	Lead (µg/dscm)	140	10.0
Cadmium (µg/dscm)	10	Cadmium (mg/dscm)	0.0014	Cadmium (µg/dscm)	10	7.1
Mercury (µg/dscm)	50	Mercury (mg/dscm)	0.0022	Mercury (µg/dscm)	28	12.7
Particulate Matter (mg/dscm)	20	Particulate Matter, filterable (mg/dscm)	5.1	Particulate Matter (mg/dscm)	20	3.9
Dioxin/furans, total (ng/dscm)	13	Dioxin, furans, total (ng/dscm)	0.52			
		Dioxin, furans, Toxic Equivalents (TEQ) (ng/dscm)	0.076	2,3,7,8-tetrachlorodibenzo-p-dioxin (ng/dscm)	0.2	2.6
Sulfur Dioxide (ppmv)	30	Sulfur Dioxide (ppmv)	7.3	Sulfur Dioxide (ppmv)	30	4.1

Table 3. Comparison of emission limits for several air pollutants under EPA's Municipal Waste Combustor (MWC) rule, the Commercial and Industrial Solid Waste Incineration (CISWI) rule, and Taylor's air permit. Note units differences – a milligram "mg" is equivalent to 1,000 micrograms "µg". Taylor's limit for 2,3,7,8-tetrachlorodibenzo-p-dioxin (a dioxin congener considered to have a toxic equivalency factor of 1) is 260% the CISWI limit for total dioxin "toxic equivalents".

However, a good case can be made that the MWC rule is not appropriately applied at the Taylor plant. Aside from the fact that the plant isn't even allowed to burn MSW in the first six months it's operating, Taylor won't be simply a municipal waste combustor, but will burn several different kinds of wastes. Because of this, it is probably more appropriate to set its emission

limits based on EPA's rule for "commercial and industrial waste incinerators" (CISWI).[55] As shown in Table 3, emissions limits set in the Taylor Biomass permit for the kinds of hazardous air pollutants emitted by burning garbage and demolition debris significantly exceed CISWI rule limits.

If Taylor Biomass moves forward, the permit should be rewritten so that emission rates are at *least* as low as those in the CISWI rule. If this "low emissions" gasification facility can't even commit to meeting the emissions limits that are required for commercial and industrial solid waste incinerators using traditional combustion technologies, how can it be considered to be "innovative," let alone "clean"? Rewriting the permit to include these enforceable limits would significantly reduce the risk to human health and the environment from the Taylor facility, although it's important to note that the CISWI rule does not contain emissions limits for arsenic and chromium, pollutants expected to be emitted by a plant that burns C&D waste.

Taylor's permitted emissions – above DOE limits

Taylor has assured DOE that their facility can meet the emissions limits required to qualify for the loan guarantee application. However, whatever is stated in the loan guarantee application, it is not legally binding. The only legally enforceable limits are those listed in the air permit, yet in some cases, the permitted emissions levels set by the state-level air permit exceed the DOE required levels.

Particulate matter

Air emissions of fine particulate matter (PM) are a serious health risk that are implicated in everything from respiratory and heart disease to cancer and low birthweight. Orange County, where Taylor Biomass would be located, already exceeds EPA's health 24-hr standard for fine particulate matter concentrations in the air, meaning that the air is already considered unhealthy. The DOE particulate matter emission standard for loan guarantee recipients is moderately rigorous, requiring PM emissions to be no more than 0.01 lb/MMBtu. However, under the current terms of its permit, Taylor biomass will be permitted to emit 0.026 lb/MMBtu, 260% the rate required by the DOE application.[56] This emission rate translates to fine particulate matter emissions of 26 tons per year and is about the same as would be found in the permit of a well-controlled coal plant.

Sulfur dioxide

Sulfur dioxide (SO_2) is a respiratory irritant that contributes to regional haze and ecosystem acidification. While biomass combustion is often promoted on the basis that biomass emits less SO_2 than coal, the Taylor Biomass plant is permitted to be a relatively large source of SO_2 under the terms of its permit. While the required DOE emission rate for SO_2 is 0.05 lb/MMBtu, the Taylor permit allows an emission rate of 0.109 lb/MMBtu,[57] more than double the allowable DOE limit. This translates to 112 tons of permitted SO_2 emissions per year.[58]

Nitrogen oxides
Nitrogen oxides (NO_x) are constituents of ground-level ozone as well as being respiratory irritants. The emission rate set in the state air permit of 25 ppm translates to a rate of 0.065 lb/MMBtu, thus Taylor does appear to meet DOE's requirement that the plant not emit more than 0.08 lb/MMBtu of NO_x. However, despite its claims of being "clean", the Taylor facility will emit more than 67 tons of NO_x per year,[59] an emission rate about the same as that of conventional biomass boiler.

Mercury
DOE requires applicants to the loan guarantee program to demonstrate that they will reduce mercury emissions by 90% relative to what is in the fuel.[60] At a certain point in the DOE review of the Taylor loan guarantee application, a series of follow-up questions indicates the agency was not reassured by Taylor's statements that "mercury will not be present in emissions".[61] Again, the emission limit set in the state air permit allows far greater emissions than Taylor has promised DOE, with the permit's limit of 28 micrograms per dry standard cubic meter[62] translating to over to over 73 pounds per year.

Not only is this permitted rate more than 12 times the amount Taylor would be allowed to emit under the CISWI rule, it is more than is allowed at nearby coal plants. Just over the New York border in Massachusetts, large coal plants are held to an emissions standard of no more than 0.0025 pounds of mercury emission per net gigawatt-hour of electricity generated.[63] Delivering 20 MW to the electrical grid and operating full-time, Taylor would generate about 175 gigawatt-hours of electricity per year and therefore be allowed to emit 0.44 lb of mercury under this rule. In other words, the rate currently allowed in the Taylor permit is 166 times greater than would be allowed for a Massachusetts coal plant. Furthermore, Taylor's permitted emission limit of over 73 pounds of mercury per year far exceeds the actual mercury emissions at any of the existing garbage incinerators or coal-fired powered plants currently operating in New York, according to 2009 data from the DEC.[64]

When DOE questioned Taylor's assertions that there would be no mercury emissions from the facility, Taylor responded by stating that they had decided to add a carbon filter system to reduce mercury emissions.[65] However, this condition is nowhere to be found in the facility's state air permit, which is the governing document and which sets the permitted emission rate of 28 micrograms per dry standard cubic meter. Until the requirement for a carbon filter is added to the air permit, Taylor Biomass should be regarded as potentially an unusually large source of mercury emissions.

Conclusion
Burning and gasifying garbage and wood is one of the fastest ways to move carbon dioxide into the atmosphere. As the planet passes the milestone of exceeding 400 ppm of atmospheric CO_2 for the first time in millennia,[66] the public may enquire why DOE or any government agency would be providing loans and grants to waste gasification, a technology that emits more CO_2 than the alternate fate, landfilling, and as a power generation technology, emits more CO_2 per MWh than modern fossil fuel burning plants.

Whatever the ultimate sustainability and carbon impact of burning biogenic materials, there is no carbon accounting scheme that can justify burning plastics and calling this 'low-emissions" energy production. In fact, the amount of greenhouse gas emissions from existing waste-burning facilities is already increasing, because the composition of MSW in the United States is becoming more and more tilted toward fossil-fuel-derived plastics. Data on waste composition show that in 1990, less than 30% of waste was comprised of plastics and other non-biogenic, fossil-fuel derivatives; by 2009, however, a full 45% of waste was non-biogenic.[67]

Providing taxpayer-funded incentives to burn this material pushes both renewable energy and waste management policies in the wrong direction, because it works against incentives to reduce packaging and recycle materials instead of throwing them away. Further, why does a power plant that is actually *paid* to "dispose" of its fuel need such generous public subsidies? Taylor projects that it will receive upwards of $50 per ton in tipping fees for MSW, which should generate more than $9 million per year in revenue. Tipping fees for the 857 tpd of construction and demolition waste the facility will accept would likely generate at least as much, again. On top of this, the facility will be generating power, for which it will be paid. If this revenue model is not sufficient to overcome the technology's risks in the eyes of private investors, why should taxpayers be left holding the bag?

There is an important role for government to play in supporting clean energy development, but taxpayer-supported programs should not entertain any proposals for power generation where CO_2 and conventional pollutant emissions exceed those from fossil fuels. DOE should deny Taylor's loan guarantee, and further should revisit its priorities for funding clean, renewable energy.

Endnotes

[1] These fuels were used during tests of a gasifer in Kansas. ("ICM biomass gasifier ready for commercial deployment". Biomass Magazine, May 5, 2011.) The facility is now being decommissioned.
[2] United States Government Accountability Office. Congressional briefing on "Department of Energy: Status of Loan Programs". March 15, 2013.
[3] http://lpo.energy.gov/programs/1703-2/
[4] http://lpo.energy.gov/programs/1703-2/
[5] Biomass Magazine. "Taylor Biomass will receive loan guarantee". April 25, 2011. http://biomassmagazine.com/articles/5442/taylor-biomass-will-receive-loan-guarantee
[6] Solyndra and other projects were approved under the "1705" program.
[7] United States Government Accountability Office. Congressional briefing on "Department of Energy: Status of Loan Programs". March 15, 2013.
[8] Taylor has had support from some influential lawmakers; for example, see http://bit.ly/10O8ZlS.
[9] Taylor Biomass application to Department of Energy Title XVII Loan Guarantee Program, Part I. Reference Number: DE-FOA-0000140, Sept. 14, 2009. Page 19.
[10] Letter to PFPI from DOE, May 16, 2013.
[11] Cornerstone Engineering. Updated engineering report for Taylor Biomass, submitted to NY Dept of Environmental Conservation, March 11, 2009. Spreadsheet, Appendix P, "Biomass gasification process mass balance".

[12] The program was initiated under the American Recovery and Reinvestment Act of 2009 and is titled, "Payments for Specified Energy Property in Lieu of Tax Credits". http://www.treasury.gov/initiatives/recovery/Pages/1603.aspx
[13] DOE loan guarantee application Part II, page 180.
[14] http://www.treasury.gov/initiatives/recovery/Documents/Message%20on%20Sequestration%201603%20Program.pdf
[15] http://www.standardandpoors.com/ratings/definitions-and-faqs/en/us#def_1
[16] RW Beck letter to Mark Paisley, evaluating Taylor Biomass facility. September 11, 2009.
[17] Internal Revenue Service. Letter ruling on qualification of Montgomery LLC for federal for tax credit. June 11, 2008.
[18] New York State Department of Environmental Conservation. Air permit ID 3-3342-00105/00009. Effective date 12/03/2010. Page 67.
[19] George Sweikert, NY DEC, email dated March 21, 2013.
[20] DOE guarantee application Part II, page 118.
[21] Other gasification plants have been proposed that would collect syngas and transform it into ethanol, rather than generating power on site.
[22] 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".
[23] Cornerstone Engineering. Updated Engineering report for Taylor Biomass, submitted to NY Department of Environmental Conservation, March 11, 2009.
[24] 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".
[25] New York State air permit, page 65.
[26] New York state air permit, page 56.
[27] The Taylor Biomass Gasification Project draft environmental impact statement, June 2010. Page 2-29.
[28] New York state air permit, pages 66 and 68.
[29] DOE loan guarantee application Part II, page 113.
[30] DOE loan guarantee application Part I, page 23.
[31] DOE loan guarantee application Part I, page 94.
[32] DOE loan guarantee application Part I, page 39.
[33] New York State Energy Research and Development Authority. Guide for siting small-scale biomass projects in New York State. Final Report 90-07, October, 2009.
[34] Cornerstone Engineering. Updated Engineering report for Taylor Biomass, submitted to NY Department of Environmental Conservation, March 11, 2009. Page 4-6.
[35] Cornerstone Engineering. Updated Engineering report for Taylor Biomass, submitted to NY Department of Environmental Conservation, March 11, 2009. Page 4-1.
[36] DOE loan guarantee application Part I, page 19.
[37] DOE loan guarantee application Part I, page 119.
[38] Internal Revenue Service. Letter ruling on qualification of Montgomery LLC for federal for tax credit. June 11, 2008.
[39] DOE guarantee application Part I, page 42.
[40] DOE loan guarantee application Part I, page 46.
[41] EPA "Greenhouse Gas Emissions" webpage, accessed March 13, 2013, at http://epa.gov/climatechange/ghgemissions/gases/ch4.html.
[42] The Tellus Institute. "Assessment of materials management options for the Massachusetts Solid Waste Master Plan review." Boston, MA. December 2008.
[43] Combustion chapter of EPA WARM documentation available at: http://www.epa.gov/climatechange/waste/downloads/Combustion.pdf
[44] DOE loan guarantee application Part I, page 47.
[45] EPA webpage accessed March 13, 2013: "Solid waste management and greenhouse gases" (http://www.epa.gov/climatechange/waste/SWMGHGreport.html#background). Combustion chapter of EPA WARM documentation available at: http://www.epa.gov/climatechange/waste/downloads/Combustion.pdf
[46] DOE loan guarantee application Part I, page 47.

[47] ESS Group, Inc. Air State Facility Permit Application prepared for Taylor Holdings Group, Ltd. Worcester, MA. May 28, 2008.
[48] Cornerstone Engineering. Updated Engineering report for Taylor Biomass, submitted to NY Department of Environmental Conservation, March 11, 2009. Page 4-21.
[49] New York State air permit, page 52.
[50] Taylor Biomass application to Department of Energy Title XVII Loan Guarantee Program Reference Number: DE-FOA-0000140, Sept. 14, 2009. Page 121.
[51] EPA, 2010. "emissions_database_boilers_heaters" data gathered in support of EPA's MACT rulemaking. Downloaded in 2011 from http://www.epa.gov/airtoxics/boiler/boilerpg.html.
[52] Epsilon Associates. Palmer Renewable Energy "Fuel Sampling and Analysis Report/Proposed Fuel Specification", August 1, 2007. Maynard, MA.
[53] MSC rule available at http://www.epa.gov/ttn/atw/129/mwc/fr10my06.pdf
[54] Both the Citizens' Environmental Coalition and NYPIRG commented extensively on the draft permits for the Taylor Biomass facility in 2010. They argued that New York State's 6 NYCRR Part 219 regulations for incinerators should be applied for the air permit. These regulations are more stringent than the federal MWC regulations which the DEC ultimately chose to use. (Comments submitted to the NYS Department of Environmental Conservation by CEC Oct. 14, Oct. 27th, and Nov. 5, 2010. Comments submitted to the NYS Department of Environmental Conservation by NYPIRG Nov. 8th 2010).
[55] Rather than being considered a MWC, the facility probably should be considered an Energy Recovery Unit (ERU) as defined under the Commercial and Industrial Solid Waste Incineration Rule (CISWI), "units that would be boilers or process heaters if they did not combust solid waste." Specifically, the unit should probably be classified as an "Energy recovery unit designed to burn biomass", which means "an energy recovery unit that burns solid waste, biomass, and non-coal solid materials but less than 10 percent coal, on a heat input basis on an annual average, either alone or in combination with liquid waste, liquid fuel or gaseous fuels (40 CFR § 60.2265 of subpart CCCC).
[56] The state air permit sets emissions at 20 mg per dry standard cubic meter, corrected to 7% oxygen. We obtained information on the facility's stack flow rate from the NY DEC permit engineer, George Sweikert, to convert this to units of lb/MMBtu. The state air permit specifies that the combustion turbine is 154 MMBtu/hr and the char burner is 80 MMBtu/hr, for a combined capacity of 234 MMBtu/hr. These two units vent out the same stack, for which the emission limit is set. Using the combined value of 234 MMBtu from the air permit, the emission rate at 20 mg per dry standard cubic meter translates to 0.026 lb/MMBtu.
[57] The permit allows 30 ppm of SO2 emissions. At the plant's specifications for stack flow rate, this translates to an emission rate of
[58] We cross-checked this conclusion against other information in the Taylor DOE application. The application also states that hydrogen sulfide (H2S) in the syngas will be produced at a mass flow rate of 16.2 lb/hr (Engineering report Appendix EE, "Combustion Turbine Specifications", page SP-101-8). This rate of H2S production translates to a production rate for sulfur (S) alone of 15.24 lb/hr, or 66.76 tons per year. Assuming all this sulfur is indeed contained in the gas as-fired, and assuming that it is all oxidized to SO2 when the gas is combusted, the emission rate for SO2 would be 133 tons per year, translating to an emission rate of 0.129 lb/MMBtu. Again, this value is more than twice the DOE limit of 0.05 lb/MMBtu. Under the terms of its air permit, Taylor Biomass does not appear to meet the DOE loan guarantee criteria.
[59] The state air permit constrains total NOx emissions to 25 ppm, which translates to an emission rate of 0.065 lb/MMBtu. The DOE allowable rate is 0.08 lb/MMBtu, which is not particularly rigorous.
[60] Taylor Biomass response to the DOE letter of inquiry dated June 2nd, 2010. Page 16.
[61] DOE loan guarantee application Part I, page 43.
[62] New York State air permit, page 75.
[63] Massachusetts Department of Environmental Protection. Mercury emission limits for coal-fired plants. http://www.mass.gov/dep/toxics/stypes/hgfact.pdf
[64] State of New York Public Service Commission. Comments of the New York State Department of Environmental Conservation regarding the verified petition of Covanta Energy Corportaion. Case 03-E-0188. August 19, 2011.
[65] Taylor Biomass response to the DOE letter of inquiry dated June 2nd, 2010. Page 17.
[66] New York Times. "Heat-trapping gas passes milestone, raising fears". May 10, 2013.
[67] SAIC, 2012. Memo to Stratus Consulting: Review and evaluation of 40 CFR Part 98 CO_2 Emission Factors for EPW07072 TO 45. June 15, 2012. http://bit.ly/13oOuwI

PFPI
driven by data

Peter W. Davidson, Executive Director
Loan Program Office
U.S. Department of Energy LP 1
1000 Independence Avenue, SW
Washington D.C. 20585

May 22, 2013

Dear Mr. Davidson,

The Department of Energy 1703 loan guarantee program has the potential to support power generation projects that increase energy independence and reduce greenhouse gas and conventional air pollutant emissions. Given our own organization's concerns that federal support for renewable energy be focused on these important goals, the Partnership for Policy Integrity (PFPI) performed a review of the loan guarantee application for Taylor Biomass (the "Montgomery Project") a 24 MW (gross) solid waste gasification facility proposed in Montgomery, New York. Our review found inconsistencies in the application for the DOE loan guarantee and other documents submitted by the facility. While we assume that DOE reviewers have likely identified many if not most of these issues, we present an overview below, which we hope will assist DOE in its consideration of the project.

Contents

The Taylor gasification facility

The Taylor Biomass facility has been proposed as a gasifier that will combust, under starved oxygen conditions, municipal solid waste (MSW), construction and demolition waste (C&D), and waste wood, consuming about 31,250 pounds of material per hour.[1] The facility's generation capacity depends on a combustion turbine burning syngas, and a char combustor that burns pyrolyzed fuel. The facility's generation capacity has been variously presented as 24 MW,[2] 19 – 21 MW (net),[3] and 20 – 25 MW.[4] The applicant has stated that the facility's efficiency is over 40 percent;[5] however, the state-level air permit specifies the capacity of the combustion turbine and the char combustor as 154 and 80 MMBtu respectively, for a combined capacity of 234 MMBtu. At an output of 24 MW, this would translate to an efficiency of 35%.

The Taylor facility has applied to the DOE 1703 renewable energy loan guarantee program under Category 2: Biomass, MSW conversion to syngas.[6] The loan guarantee application states that the facility will gasify around 400 tons wet weight (300 tons dry weight) of MSW per day and construction waste (including non-wood materials such as plastics), and some amount of waste wood, apparently up to 100 tons per day.[7] (This claim is not substantiated by the state air permit, however, as discussed below). The loan guarantee application states that the facility will export around 20 MW of electricity to the grid; as a 24 MW (gross) plant, this suggests that the plant's parasitic load is around 17 percent, which is relatively high for a biomass combustion facility. For conventional combustion biomass plants, parasitic load is usually 10 – 12 percent.

Gasification produces conventional and hazardous air pollutants

At Taylor, gasification of fuel will produce syngas, which is combusted in a combustion turbine that is essentially the same as utilized by a natural gas combustion plant. The pyrolyzed material remaining after gasification is called char, which is burned in a conventional burner known as a char combustor. The 24 MW Taylor plant will consume 25,000 dry lb/hr (31,250 as delivered) of MSW, wood, and C&D waste,[8] and will in turn produce 8,210 lb per hr of char to be burned in the char combustor,[9] indicating that about 33% of the feedstock for gasification is ultimately burned in a conventional boiler after it has been pyrolyzed. The engineering report states that the char burner produces 3,670 lb of ash per hour,[10] which amounts to about 44 tons per day, although elsewhere it is stated that the ash generation will be 36 tons per day.[11] The ash will contain heavy metals and other compounds that have not been volatilized, and therefore may require special disposal.

The Taylor plant will emit hazardous air pollutants (HAPs). There are few if any actual data on the suite of pollutants emitted by MSW gasification. Taylor used EPA's AP-42 emission factors for natural gas to estimate HAPs emissions from the combustion turbine for purposes of their air permit application to New York State, and estimated HAPs emissions from the char burner using the AP-42 emission factors for wood-fired boilers. However, as the facility will gasify garbage and construction and demolition waste, including plastics and other synthetics, the AP-42 emissions factors for natural gas and virgin wood very likely underestimate emissions of HAPs from the Taylor facility.

Taylor could be a significant source of heavy metals

The applicant has estimated HAPs emissions from the char burner using the AP-42 emission factors for wood-fired boilers. However, the AP-42 factors are based on "clean" wood, and are not appropriate for estimating emissions from fuel that may contain treated wood and other contaminants. To demonstrate the difference in heavy metals content between untreated wood and demolition waste that contains small amounts of pressure-treated wood, PFPI retrieved data on the metals content of "unadulterated" wood from a recent EPA database[12] of fuel contaminant values that was assembled for the "boiler rule" rulemaking, and compared these data with a study on metals content in samples of construction and demolition (C&D) wood that was conducted in Massachusetts.[13] The unadulterated wood data included samples that had been tested for chromium (99 samples) and arsenic (55 samples), ingredients of the copper-chromium-arsenate (CCA) cocktail that has long been used as a pressure-treatment wood preservative, but which should be present only at low concentrations in unadulterated wood. We also retrieved data on lead (67 samples), which could be found in some painted demolition wood but should also be found at relatively low concentrations in untreated wood.

The C&D analysis study contained data on weight percentage of each sample of wood chips that was comprised of CCA-treated wood, reporting a range of 0.8% to 6.1% in 15 composite samples that were collected after demolition wood was chipped. The ranges and averages of metals concentrations in those samples, in parts per million (ppm), were as follows, with the lowest values for metals found in the samples with the lowest amount of C&D wood:

	Chromium	Arsenic	Lead
Range of metals content from fuel analysis study (ppm)	8.4 - 185	6.9 - 165	6.8 - 148
Average of metals content from fuel analysis study (ppm)	81.6	72.6	51.4
Range of metals for "unadulterated" wood in EPA data (ppm)	0.1 - 72.7	0.12 - 68.36	0.1 - 106
Average of metals for "unadulterated" wood in EPA data (ppm)	3.13	1.24	1.58

Table 1. Ranges and averages for metals concentrations in samples of construction and demolition wood collected for a fuel study in Massachusetts, and EPA data on "unadulterated" wood fuel samples from a variety of facilities.

These data demonstrate that even when wood chip fuel contains relatively small amounts of CCA-treated wood, this significantly elevates the content of heavy metals over what is found in unadulterated wood, even when the set of unadulterated wood samples contains some relatively high values. No matter what is claimed, it is impossible for Taylor Biomass to remove 100% of pressure-treated wood from the fuel stream, to say nothing of the metals and other toxics that enter the fuel stream from MSW. It is therefore not appropriate for them to use EPA factors that are derived from clean wood to estimate their emissions of heavy metals and other hazardous air pollutants from the char burner, because to do so underestimates actual emissions.

Emissions of carcinogens are unknown

The engineering report prepared for the Taylor facility recognizes that real emissions are unknown, including the following risk and its potential mitigation:

> "*Condensable organics will be polyaromatics and are therefore suspect carcinogens. The gas conditioning reactor will destroy 90% of these materials. The remainder will be removed by scrubbing and disposed of within the process combustor or by treatment of the process waste water stream*."[14]

Likewise, the air permit application states that the combustion turbine "*will also emit unburned hydrocarbons, 20% of which are assumed to fall within the category of volatile organic carbons*."[15] Taylor Biomass also identifies "*MSW contaminants causing environmental concern*" as a risk, and poses as a mitigation, "*removal of pressure treated and painted wood is monitored and controlled to eliminate those materials from the biomass stream*."[16]

Given that the Taylor gasification process has never been tested at scale, and given that the facility has chosen to estimate emissions rather than reporting emissions data from a test facility, the assurance that carcinogens and other toxics will be eliminated is little more than speculation. While the air permit does require testing for certain toxic emissions, this testing will occur one time only, within 180 days of when the facility starts using MSW as fuel.[17]

The facility will burn a significant amount of plastics as fuel

The composition of the fuel at the Taylor facility will affect its heat content as well as emissions of air pollutants and greenhouse gases, but the loan guarantee application and associated documents submitted to DOE make conflicting claims about the amount of plastics that will be burned as fuel. Sometimes, the application makes it sound as if no or only very little synthetic materials will be burned – for instance, the loan guarantee application states that the facility's design and process "converts the organic biomass portion of mixed solid waste to energy,"[18] and that "small" quantities of plastics and other similar materials "may also" be used as input[19] to the gasifier. The 2008 "Private Letter Ruling"[20] from the IRS on the eligibility of the facility for tax credits makes it sound as if no synthetics will be used as fuel:

> "***the facts as represented by Taxpayer and Taxpayer's representatives are as follows****… the material fed into the plant prior to sorting is expected to be at least 65 percent organic by weight. The material that makes it through sorting to fuel the Plant* ***will be 100 percent organic in terms of Btu content***" (emphasis added).

However, it is clearly not the case that the fuel will be 100% organic, as both the MSW portion and the construction waste portion of the facility's fuel supply will contain plastics and other synthetic materials. The engineering report prepared for the plant states "*the Processed Biomass Fuel generated is anticipated to include items such as paper, food, wood (excluding pressure treated and painted), fiber, leather, textiles, and select plastics*."[21] In fact, the plant's design for sorting materials will preferentially feed certain plastics to the gasifier. Describing the sorting process for recovering "acceptable" materials that can be recycled out of the construction and demolition (C&D) waste stream, the engineering report states, "*the lighter density fraction (assumed to be comprised of plastics and various unacceptable materials) extracted from the re-circulating air stream of the Air Separator will be captured… and transported to a trash compactor. Then compacted… then transferred to the Biomass Processing Building to become*

an acceptable portion of the Processed Biomass Fuel." This part of the C&D stream will not only include plastics, but also carpet and other synthetic materials.

The ability of the plant to function as promised depends on burning plastics

The amount of plastics used as fuel has important implications for the fuel's heat content and greenhouse gas emissions because plastic is so carbon- and energy-rich. It is not an exaggeration to say that the Taylor Biomass facility's ability to produce energy at its current specifications greatly depends on the presence of a significant amount of plastic being in the fuel. This point is made in a report from The New York State Energy Research and Development Authority (NYSERDA), which documented how Taylor analyzed its fuel, collecting 1,000 pounds of MSW, sorting and separating it, then pelletizing the fuel portion.[22] The pellets were sent to the National Energy Research Laboratory (NREL) in Golden, Colorado, where the fuel was analyzed and gasified in a test gasifier. The NYSERDA report states (emphasis added)

> "*Eighty-seven percent of the MSW received from Orange County could be used in the gasification process. However, almost 20% of this 87% are plastics or plastic based materials. Most concerning is the fact that such material, even if not accounted for in the production of renewable energy, may not be part of the fuel mix to qualify under the RPS. Thus a substantial proportion of the material coming in will need to be excluded if the fuel is to qualify under the NYS RPS.*
>
> *The material tested at NREL had an actual Btu content per pound of 7,870 as tested.* ***By weight of the material, the plastics, textiles, and styrofoam made up 20% of the material that could be used in the gasifier.*** *This plastics based material is very high in Btu content with an estimated value of 18,000 Btu/pound. Remaining material without the plastics had a Btu content of 5,338 Btu/pound.* ***Thus by weight 20% of the material coming from plastics provided 46% of the heating value,*** *so eliminating plastic material from the MSW would produce a significant reduction in the heating value of the fuel*."

The values reported by NYSERDA appear to match values used in the Taylor facility's engineering report, which states "it is projected that between 68 and 72% of 500 TPD of MSW received will be utilized as Processed Biomass Fuel, with the remaining portions to be recovered as recyclables or landfilled."[23] The applicant also states, however, "*plastic and textile (non-biogenic) will be minor due to the sorting process*."[24] As the engineering report states that the heating value of the fuel is 7,500 Btu/pound,[25] we assume that the fuel is assumed to match the specifications identified in the NYSERDA report and will be about 20 percent synthetic and plastics by weight. Given the dependency of the facility on burning plastics to generate energy under its specified operating design, the amount of plastics should perhaps be considered "vital," rather than "minor."

We also noted that the Taylor application states that the facility can produce 1,500 kWh per ton of material,[26] but this is more than twice the amount of energy production for gasification, 660 kWh per ton, as found by the Tellus Institute in a report commissioned by the State of Massachusetts.[27]

Taylor's permit allows only clean wood as fuel, compromising its "innovative" status

Taylor has told DOE that they should receive the loan guarantee under the 1703 program to support "innovative" projects because even though each component of the approach they will employ has been used elsewhere, the components have not been used before in combination. In response to DOE's request that they identify what makes the project novel, they state, "*The novelty of the Taylor Process is the configuration of this equipment combined with the manual processes to create the desired gasifier feedstock*."[28]

Elsewhere, they make it clear that utilizing MSW as fuel is integral to the project, and that MSW "will" be accepted as fuel:

> *"The Taylor Biomass Energy Solution is a proprietary, innovative and customizable system that will accept MSW and C&D as a raw energy source, separate out and recycle the small portion of the waste material not suitable for energy production, produce a stable, cost effective biomass feed stock from the remainder, and use the feed stock to fuel its proprietary gasification process, which produces steam power and a relatively clean MCV product gas that can directly substitute for natural gas in industrial process equipment. The steam and product gas can then power a combined cycle electric power generation facility. This system replaces the current MSW and C&D disposal process (landfills and incinerators) with an environmentally friendly process that also generates clean, renewable supplies of energy at a competitive price while essentially eliminating the production of greenhouse gasses."*

Yet it is clear from the facility's state air permit that use of MSW as fuel is *not* initially permitted at the project, and perhaps never will be, if the emissions exceed the permitted standards. Item 85.4 of the state air permit states the main facility process to be a

> *"Combustion turbine and process combustor* ***operating on clean wood only****. Clean wood means untreated wood or untreated wood products including clean untreated lumber, tree stumps (whole or chipped), and tree limbs (whole or chipped). Clean wood does not include yard waste or construction, renovation and demolition wastes."*[29](emphasis added)

A permit engineer for the NY Department of Environmental Conservation stated that the facility would begin operation using only clean wood, then after six months they would conduct emissions testing. They would then introduce MSW into the process, and within 18 months, they would conduct another round of emissions testing.[30] In short, the facility has represented itself to DOE as "novel" based on its use of MSW as fuel, but it is not clear that it will meet DOE's mandatory emissions limits even using clean wood as fuel, much less MSW, and may thus never be allowed to burn MSW at all.

Claims of reductions in greenhouse gas emissions are not supported

One requirement of the loan guarantee application is that the "*applicant must quantify in tons the amount of anthropogenic GHG emissions and air pollutants the project will avoid, reduce, or sequester compared to conventional technologies on the US marketplace today*."[31] The Taylor application does not appear to provide this information, stating instead that widespread adoption of the facility's technology would avoid emissions of 30 million tons of greenhouse gases, an estimate that is apparently based on the idea that burning waste decreases or eliminates emissions compared to landfilling it. The application states,

> "*Emissions of greenhouse gasses from landfills amount to approximately 2.5 pounds for every pound of carbon in the landfill. Methane has a global warming potential (GWP) 21 times that of carbon dioxide, the major component in greenhouse gases. Over 75% of the methane emissions in the environment originate from MSW decomposition in landfills. By converting the organic material into sustainable energy, these emissions can be virtually eliminated*."[32]

However, these claims are not backed up with any data and actually contradict EPA estimates of landfill methane emissions. In fact, EPA estimates that landfills contribute only 16% of methane emissions, with a far greater portion (37%) coming from natural gas and petroleum production[33] (this estimate pre-dates new data that shows that fugitive emissions of methane from fracking are significant). Further, the claim that emissions are "eliminated" through combustion is obviously unsupportable.

The application goes on to state:

> *"Since the post-sorted biomass from C&D and MSW residuals is a sustainable biomass source, the net CO_2 emissions from the overall process (as with other biomass systems), is near zero. Due to the significant efficiency improvement when compared to more conventional combustion technologies, CO_2 emissions are greatly reduced on a per unit product basis at the plant stack, even before being recycled in the biomass life cycle. These "raw CO_2" emissions are expected to be approximately 1670lb/MWh produced compared to over 2900 lb/MWh for conventional technologies."*[34]

The claim that emissions are "near zero" because C&D and MSW residuals are a "sustainable biomass source" is not supportable, partly because it is clear that a significant proportion of the fuel stream is plastics and other synthetics derived from fossil fuels, as discussed above. Further, this claim disregards the fact that EPA has determined that landfills that capture methane are relatively low-emitting sources of greenhouse gases, and actually represent net carbon sequestration for many organic materials that decompose very slowly. In contrast, burning or gasifying these materials emits carbon into the atmosphere instantaneously.

Further, EPA estimates that waste combustion produces emissions of nitrous oxide (N_2O),[35] a greenhouse gas with 310 times the global warming potential of CO_2. It is not clear how much N_2O the gasification process emits, but it is unlikely to be zero.

Plastics burned at the Taylor plant will be a significant source of greenhouse gas emissions

Documentation[36] for EPA's tool for assessing the greenhouse gas emissions of waste disposal strategies, the WAste Reduction Model (WARM), points out that "*combustion of plastics results in substantial net GHG emissions. This result is primarily because of the high content of non-biomass carbon in plastics*." EPA documents a wide range in the carbon content of plastics, from 38 percent to 92 percent, with a weighted average of 77 percent. In contrast, the carbon content of wood and other biological materials is generally in the 48 – 50 percent range.

The facility is a Industrial Solid Waste Incinerator and should be classified as such

The Taylor air permit has been written with most pollution limits based on EPA's new source performance standards for municipal waste combustors (MWC).[37] However, aside from the fact that the plant isn't even allowed to burn MSW in the first six months it is operating, Taylor won't be simply a municipal waste combustor, but will burn several different kinds of wastes. Because of this, it is probably more appropriate to set its emission limits based on EPA's rule for "commercial and industrial waste incinerators" (CISWI). Under this rule, Taylor should be considered an Energy Recovery Unit (ERU), "units that would be boilers or process heaters if they did not combust solid waste," and specifically, the unit should probably be classified as an "Energy recovery unit designed to burn biomass," i.e., "an energy recovery unit that burns solid waste, biomass, and non-coal solid materials but less than 10 percent coal, on a heat input basis on an annual average, either alone or in combination with liquid waste, liquid fuel or gaseous fuels."[38]

MWC limits for new large units		CISWI limit for new biomass ERU's burning solids		Taylor Biomass air permit limit		Taylor/CISWI limits ratio
Hydrogen chloride (ppmv)	25	Hydrogen chloride (ppmv)	0.2	Hydrogen chloride (ppmv)	25	125.0
Lead (µg/dscm)	140	Lead (mg/dscm)	0.014	Lead (µg/dscm)	140	10.0
Cadmium (µg/dscm)	10	Cadmium (mg/dscm)	0.0014	Cadmium (µg/dscm)	10	7.1
Mercury (µg/dscm)	50	Mercury (mg/dscm)	0.0022	Mercury (µg/dscm)	28	12.7
Particulate Matter (mg/dscm)	20	Particulate Matter, filterable (mg/dscm)	5.1	Particulate Matter (mg/dscm)	20	3.9
Dioxin/furans, total (ng/dscm)	13	Dioxin, furans, total (ng/dscm)	0.52			
		Dioxin, furans, Toxic Equivalents (TEQ) (ng/dscm)	0.076	2,3,7,8-tetrachlorodibenzo-p-dioxin (ng/dscm)	0.2	2.6
Sulfur Dioxide (ppmv)	30	Sulfur Dioxide (ppmv)	7.3	Sulfur Dioxide (ppmv)	30	4.1

Table 2. Comparison of emission limits for several air pollutants under EPA's Municipal Waste Combustor (MWC) rule, the Commercial and Industrial Solid Waste Incineration (CISWI) rule, and Taylor's air permit. Note units differences – a milligram "mg" is equivalent to 1,000 micrograms "µg". Taylor's limit for 2,3,7,8-tetrachlorodibenzo-p-dioxin (a dioxin congener considered to have a toxic equivalency factor of 1) is 260% the CISWI limit for total dioxin "toxic equivalents".

If this is the case, the state air permit would need to be re-written so that the unit could meet the CISWI NSPS and Emissions Guidelines (EG) emissions limits. As shown in Table 2, emissions limits set in the Taylor Biomass permit for the kinds of hazardous air pollutants emitted by burning garbage and demolition debris significantly exceed CISWI rule limits. Rewriting the permit to include emissions limits from the CISWI rule would significantly reduce the risk to human health and the environment from the Taylor facility. Further, if this "low emissions" gasification facility can't even commit in its permit to meeting the emissions limits that are required for commercial and industrial solid waste incinerators using traditional combustion technologies, how can it be considered to be providing "clean" energy?

Emissions limits set in the permit do not reach DOE's standards

The applicant has assured DOE that the Taylor facility will meet the emissions levels required in the loan guarantee application. Yet in some cases, the emissions levels set by the state-level air permit for the facility are higher than the DOE required levels. This is another consequence of the state air permit being written with pollution limits based on EPA's new source performance standards for municipal solid waste combustors, which are the only enforceable limits for the facility.

Particulate matter emissions exceed DOE's qualifying threshold

In response to the DOE requirement that particulate matter (PM) emissions not exceed 0.01 lb/MMBtu, the applicant responds that the facility will emit "less than 0.16 lb per MW generated."[39] We calculated the facility's potential to emit for PM, converting this unconventional presentation of data to the units that DOE requested. Assuming 24 MW of generation (gross), 8,760 hours of operation, and the fuel input rate of 188 MMBtu/hr specified in the engineering report,[40] the applicant's stated 0.16 lb/MW emission rate would translate to 0.02 lb/MMBtu, 200% of the DOE requirement of 0.01 lb/MMBtu.

However, values for PM emissions specified in the facility's controlling document, the state air permit, are different still, with a limit set at 20 mg per dry standard cubic meter, corrected to 7% oxygen. Converting this to units of lb/MMBtu,[41] and assuming the fuel input rate of 188 MMBtu/hr specified in the engineering report,[42] this translates to an emission rate of 0.032 lb/MMBtu, 320% higher than the DOE required rate. Again, however, there is a discrepancy between the facility specifications in the loan guarantee application, and the air permit, this time regarding the actual combined MMBtu capacity of the gas turbine and the char combustor. The engineering report accompanying the loan guarantee application specifies that the heat input of the fuel is 188 MMBtu/hr,[43] but the state air permit (which is the controlling document) specifies[44] that the combustion turbine is 154 MMBtu/hr and the char burner is 80 MMBtu/hr, for a combined capacity of 234 MMBtu/hr. This discrepancy makes a difference for the estimated emissions rates of PM and other pollutants, which are set on the basis of emissions from the single stack that vents both the combustion turbine and the char burner. Using the combined value of 234 MMBtu from the air permit, which is the correct value as the permit is the controlling document, the emission rate at 20 mg per dry standard cubic meter would translate to 0.026 lb/MMBtu, 260% the rate required by the DOE application.

Sulfur dioxide emissions exceed DOE's qualifying threshold

DOE requires sulfur dioxide (SO_2) emissions to be no greater than 0.05 lb/MMBtu. The applicant states that the emissions from the Taylor facility will be "less than 0.25 lb per MW."[45] Converting this to DOE's units, and assuming a heat input of 188 MMBtu/hr, this translates to an emission rate of 0.003 lb/MMBtu. However, the emission limit that is actually set in the state air permit is 30 ppm, which translates to an emission rate of 0.136 lb/MMBtu assuming a heat input of 188 MMBtu, or 0.109 lb/MMBtu assuming the air permit's combined capacity value of 234 MMBtu. This rate is more than twice the required DOE emission rate of 0.05 lb/MMBtu and translates to a total emission of SO_2 of 112 tons per year. Again, the air permit is the controlling document, so the only enforceable limit on the facility's SO_2 emissions far exceeds what they have stated to DOE.

The applicant's statement that SO_2 emissions will be low is apparently predicated on a high degree of sulfur removal in the product gas. We were not able to locate any reference to what this removal rate might be, however, due to the heavy redactions in the documents we received. However, one section of the engineering report, the combustion turbine specifications document, states "*the combustion turbine shall be capable of firing either product gas or natural gas. The product gas shall be generated at a rate of 27,000 lb/hr. The fuel characteristics of each of these fuels is indicated by typical specifications or analyses included below,*"[46] suggesting that the composition specifications that are provided are for "as-fired" syngas, after the majority of the sulfur has been removed by the scrubbing process. The document then goes on to state that the Product Gas composition includes a mass flow rate of 16.2 lb/hr of hydrogen sulfide (H_2S).[47] This rate of H_2S production translates to a production rate for just sulfur (S) of 15.24 lb/hr, or 66.76 tons per year. Assuming all this sulfur is indeed contained in the gas as-fired, and assuming that it is all oxidized to SO_2 during combustion, the emission rate for SO_2 would be 133 tons per year, translating to an emission rate of 0.129 lb/MMBtu at a boiler capacity of 234 MMBtu/hr.

Mercury emissions have been permitted at more than 73 pounds per year

DOE requires applicants to the loan guarantee program to demonstrate that they will reduce mercury emissions by 90%.[48] In their review of the Taylor loan guarantee application, DOE did not seem reassured by Taylor's statements that "mercury will not be present in emissions"[49] (because mercury-containing materials would be removed in the fuel sorting process). Again, the emission limit set in the state air permit allows far greater emissions than Taylor has promised EPA, with the MSC rule limit of 28 micrograms per dry standard cubic meter [50] translating to over to over 73 pounds per year.

Just over the New York boarder, in Massachusetts, large coal plants are held to an emissions standard of no more than 0.0025 pounds of mercury emission per net gigawatt-hour of electricity generated.[51] Delivering 20 MW to the grid and operating full-time, Taylor would generate about 175 gigawatt-hours of electricity and therefore be allowed to emit 0.44 lb of mercury under this rule. In other words, the rate currently allowed in the Taylor permit is 166 times greater than would be allowed for a neighboring coal plant. Furthermore, Taylor's permitted emission limit of over 73 pounds of mercury per year far exceeds the actual mercury emissions at any of the

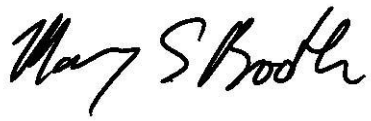
existing garbage incinerators or coal-fired powered plants currently operating in New York, according to 2009 data from the DEC.[52]

We are aware that the applicant has told DOE that they subsequently decided to add a carbon filter system for mercury removal,[53] but this condition is nowhere to be found in the facility's final state air permit, which is the governing document and which sets the above permitted emission rate of 28 micrograms per dry standard cubic meter.

In conclusion: The Taylor Biomass facility is little more than a garbage incinerator with an altered combustion process. The facility can't commit to meeting DOE emission rates and won't reduce greenhouse gases – in fact, it will increase them. A technology as speculative and polluting as the Taylor facility, and indeed, any biomass or garbage gasification facility, does not deserve DOE support, or any public funding that is intended to support "green" energy generation. Therefore, we would strongly recommend that DOE not provide a loan guarantee to the Taylor project.

Thank you for your consideration of these comments.

Mary S. Booth



Director, Partnership for Policy Integrity

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[1] 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".
[2] Taylor Biomass application to Department of Energy Title XVII Loan Guarantee Program Reference Number: DE-FOA-0000140, Sept. 14, 2009. Page 20.
[3] Cornerstone Environmental Group, LLC. Operations and maintenance manual, prepared for Taylor Holdings Group. November, 2008. Page 1-3.
[4] New York State Department of Environmental Conservation. Air permit for Taylor Holdings Group, LTD. Permit ID for Air State Facility 3-3342-00105/00012. Effective date 12/03/2010. Page 1.
[5] DOE loan guarantee application Part I, page 49.
[6] DOE loan guarantee application Part I, page 19.
[7] Engineering report, page 4-9.
[8] Adjusting for the claimed moisture content of 25%, the 25,000 dry lb of waste per hour equates to 400 tons of waste per day on an "as received" basis.
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[10] 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".
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[12] EPA, 2010. "emissions_database_boilers_heaters" data gathered in support of EPA's MACT rulemaking. Downloaded in 2011 from http://www.epa.gov/airtoxics/boiler/boilerpg.html.

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[14] Engineering report, page 4-21.
[15] Taylor Biomass air permit application, May 22, 2008.
[16] DOE loan guarantee application Part I, page 121.
[17] New York State air permit, page 52.
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[19] DOE loan guarantee application Part I, page 119.
[20] Internal Revenue Service. Letter ruling on qualification of Montgomery LLC for federal for tax credit. June 11, 2008.
[21] Engineering report page 4-1.
[22] New York State Energy Research and Development Authority. Guide for siting small-scale biomass projects in New York State. Final Report 90-07, October, 2009.
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[24] Response of Taylor Biomass to questions posed by DOE in the loan review. The document we received was labeled "3-1.Part I TBE Montgomery Request 1-11 Response RIF'
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[26] DOE loan guarantee application Part I, page 48
[27] The Tellus Institute and Cascadia Consulting Group & Sound Resource Management, December, 2008, "Assessment of Materials Management Options for the Massachusetts Solid Waste Master Plan Review." Page 7.
[28] Response to the Department of Energy Letter of Inquiry dated June 2nd 2010 Re: DE-FOA-0000140. p. 21, question #11 of DOE's queries.
[29] New York State air permit, page 67.
[30] George Sweikert, NY DEC, email dated March 21, 2013.
[31] DOE guarantee application Part I, page 42.
[32] DOE loan guarantee application Part I, page 46.
[33] EPA "Greenhouse Gas Emissions" webpage, accessed March 13, 2013, at http://epa.gov/climatechange/ghgemissions/gases/ch4.html.
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[35] Combustion chapter of EPA WARM documentation available at: http://www.epa.gov/climatechange/waste/downloads/Combustion.pdf
[36] EPA webpage accessed March 13, 2013: "Solid waste management and greenhouse gases" (http://www.epa.gov/climatechange/waste/SWMGHGreport.html#background). Combustion chapter of EPA WARM documentation available at: http://www.epa.gov/climatechange/waste/downloads/Combustion.pdf
[37] MSC rule available at http://www.epa.gov/ttn/atw/129/mwc/fr10my06.pdf
[38] 40 CFR § 60.2265 of subpart CCCC
[39] DOE loan guarantee application Part I, page 44.
[40] 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".
[41] We obtained information on the facility's stack flow rate from the NY DEC permit engineer, George Sweikert.
[42] 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".
[43] 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".
[44] New York State air permit, page 67.
[45] DOE loan guarantee application Part I, page 43.
[46] O'Neal Engineering. Section SP-101 of Engineering Report. Gas turbine generating unit, gasification and power unit specifications. Revision date 4/30/2007.
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[48] Taylor Biomass response to the DOE letter of inquiry dated June 2nd, 2010. Page 16.
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[52] State of New York Public Service Commission. Comments of the New York State Department of Environmental Conservation regarding the verified petition of Covanta Energy Corportaion. Case 03-E-0188. August 19, 2011.
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